DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
2000 NAVY PENTAGON
WASHINGTON, D.C. 20350-2000

IN REPLY REFER TO
9462
N774/786714
June 16, 2004

From: Chief of Naval Operations (N774)
To: Director, Office of Protected Resources
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
1315 East-West Highway
Silver Spring, Maryland 20910

Subj: APPLICATION FOR RENEWALS OF LETTERS OF AUTHORIZATION FOR THE TAKING OF MARINE MAMMALS INCIDENTAL TO THE OPERATION OF SURTASS LFA SONAR ONBOARD R/V *CORY CHOUEST* AND USNS IMPECCABLE (T-AGOS 23) UNDER NMFS FINAL RULE (50 CFR 216 SUBPART Q)

Ref:
(a) Final Rule: Taking and Importing Marine Mammals; Taking Marine Mammals Incidental to Navy Operations of Surveillance Towed Array Sensor System Low Frequency Active Sonar (Federal Register Vol. 67 No. 136, 16 July 2002)
(b) Letter of Authorization Governing the Take of Marine Mammals Incidental to the U.S. Navy's Operation of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar on the USNS IMPECCABLE, Office of Protected Resources, National Marine Fisheries Service, August 14, 2003
(c) Letter of Authorization Governing the Take of Marine Mammals Incidental to the U.S. Navy's Operation of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar on the R/V *Cory Chouest*, Office of Protected Resources, National Marine Fisheries Service, August 14, 2003
(d) Application for Letters of Authorization for the Taking of Marine Mammals Incidental to the Operation of SURTASS LFA Sonar Onboard R/V *Cory Chouest* and USNS IMPECCABLE (T-AGOS 23) under NMFS Final Rule (50 CFR 216 Subpart Q)
(e) Annual Report No. 2: Operation of the Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar Onboard the R/V *Cory Chouest* and USNS IMPECCABLE (T-AGOS 23) Under the National Marine Fisheries Service Letters of Authorization of 16 August 2003, Maritime Surveillance Systems (PMS 485), May 2004

(f) Final Overseas Environmental Impact Statement and Environmental Impact Statement for Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar, Department of the Navy, January 2001

Encl: (1) Stipulation Regarding Permanent Injunction, Civ. No. 02-3805-EDL, United States District Court, Northern District of California, San Francisco Division, October 14, 2003
(2) North Pacific Ocean Mission Areas and Boundary Conditions - R/V *Cory Chouest* and USNS IMPECCABLE Combined Planned Mission Areas for 3rd Year LOAs
(3) Background for Marine Mammal Density and Stock Estimates for SURTASS LFA 3rd Year LOAs
(4) Estimates for Potential Effects to Marine Mammal Stocks

1. Pursuant to reference (a), renewals of the Letters of Authorization (LOAs) are requested for the Research Vessel (R/V) *Cory Chouest* and USNS IMPECCABLE (T-AGOS 23), for the taking of marine mammals (Levels A and B) incidental to operations of the Navy's Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) sonars for the 12-month period commencing August 16, 2004, as specified below. The proposed mission areas are comprised of portions of biogeographic provinces 50, 53, 56, 63, 64, and 69 as described in reference (a) (50 CFR 216.180). Due to critical naval warfare requirements, the Chief of Naval Operations (CNO) has identified the necessity for both SURTASS LFA vessels to be stationed in the North Pacific Ocean to conduct testing, training and routine operations at least through fiscal year 2005. As such, the analysis performed herein is based on 16 nine-day missions or equivalent shorter missions, regardless of which vessel is performing a specific mission. Total transmission time will not exceed 432 hours combined for both vessels.

2. The mission areas requested under this application are the same as those requested and authorized under the current LOAs for the USNS IMPECCABLE and R/V *Cory Chouest* (references [b] and [c]), as limited by enclosure (1). Enclosure (2) provides graphical representations of the mission areas and the boundary conditions thereto. The Navy acknowledges that it will continue to adhere to the more stringent requirements of enclosure (1) including:

- No operations in the waters off the Hawaiian Islands;
- For the Stipulated Area within the Philippine Sea, a coastal exclusion zone of at least 60 nautical miles (nm) or 30 nm seaward of the 200-meter isobath;

- For all others including Taiwan, a coastal exclusion zone of 30 nm; and
- Seasonal restrictions reflected in enclosure (2).

3. The same analysis methodology utilized in the application for the current LOAs (reference [d]) and the most recent Annual Report (reference [e]) was utilized to provide reasonable and realistic estimates of the potential effects to marine mammal stocks, as set forth in the SURTASS LFA Overseas Environmental Impact Statement/ Environmental Impact Statement (OEIS/EIS) (reference [f]). This analytical methodology was used to estimate the potential effects to marine mammal stocks specific to the potential mission areas as presented in enclosure (2). It is infeasible to model all potential mission areas for all species' stocks for all seasons. In this application, model sites and seasons are based on reasonable and realistic choices for SURTASS LFA operations proposed herein. The CNO's mission for SURTASS LFA operations to be conducted under the requested LOAs is to train the Navy crews manning the vessels and to test and operate the LFA systems in as many and varied at sea environments as possible. The Navy has determined that the SURTASS LFA sonar testing and training operations that are the subject of NMFS' July 16, 2002, Final Rule (reference [a]) constitute a military readiness activity as that term is defined in PL 107-314 (16 U.S.C. § 703 note) because those activities constitute "training and operations of the Armed Forces that relate to combat" and constitute "adequate and realistic testing of military equipment, vehicles, weapons and sensors for proper operation and suitability for combat use."

4. Enclosure (3) provides information on how the density and stock/abundance estimates were derived for the selected acoustic model sites shown in enclosure (2). These data were derived from current available published source documentation, and provided general area information for each mission area, with species-specific information on the animals that could potentially occur in that area, including estimates for their stock/abundance and density.

5. Enclosure (4) provides estimates of potential effects to marine mammal stocks during the 12-month period commencing August 16, 2004. These values support the conclusion that estimates of potential effects to marine mammal stocks are below the criteria delineated by NMFS in reference (a). Upon completion of the missions under the requested authorization, these estimates will be refined and submitted to NMFS under the reporting requirements of reference (a), and the conditions of the LOAs, as issued.

6. SURTASS LFA sonar will be operated in accordance with the geographic restrictions and monitoring mitigation delineated in references (a) and (f); additional interim operational restrictions delineated in reference (a); the conditions of the LOAs, as issued; and the restrictions of the tailored Permanent Injunction as delineated in enclosure (1).

7. For the period of the LOAs, the means to increase knowledge of marine mammal species and determine the level of impacts on marine mammals from potential takes will be determined by the Navy in consultation with NMFS. Long-term independent scientific research efforts on topics designed to fill data gaps and further the overall understanding of the effects of anthropogenic sound and noise on the marine environment are being performed to fulfill conditions of the Final Rule and LOAs, to provide data for a supplemental environmental impact statement, and to address concerns raised by the Court. These research efforts are discussed in the Annual Report No. 2 (reference [e]) under the current LOAs.

8. If current mission plans are modified to the extent that operating area different or additional to the biomes/provinces described in paragraph (1) above are required, and/or updates to enclosure (4) estimates become necessary, this letter will be revised and resubmitted to NMFS as early as possible.

9. The point of contact for this effort is Mr. Joseph S. Johnson, who can be reached at (858) 537-8967.

F. J. DIEMER
Captain, U. S. Navy
Head, Undersea Surveillance

Enclosure (1)
Stipulation Regarding Permanent Injunction, Civ. No. 02-3805-EDL
United States District Court, Northern District of California, San Francisco Division, October 14, 2003

ORIGINAL

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UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

NATURAL RESOURCES DEFENSE COUNCIL, INC., et al.,

Plaintiffs,

v.

DONALD L. EVANS, et al.,

Defendants.

Civ. No. 02-3805-EDL

STIPULATION REGARDING PERMANENT INJUNCTION

Pursuant to the Court's August 26, 2003, Opinion and Order on Cross Motions for Summary Judgment (Opinion and Order) in this matter, and after the meet and confer process directed by that Opinion and Order, the parties have arrived at the following Stipulation:

1. Neither party waives any right of appeal from the Opinion and Order or from the Order entering this Stipulation by entering into the meet and confer process or by submitting this agreed upon Stipulation.

2. The parties agree that all negotiations leading up to this Stipulation are confidential.

3. The parties agree that this Stipulation shall remain in effect unless modified by the Court until the earlier of: (a) the expiration of the Final Rule, 50 C.F.R. Part 216, Subpart Q (Taking of Marine Mammals Incidental to Navy Operations of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar) (Final Rule); (b) the determination by this Court, pursuant to a noticed motion or stipulation by the parties, that the Opinion and Order and this Stipulation are superseded by subsequent relevant events or authority, including but not limited to the outcome of any appeal; or (c) the issuance of a mandate by a higher court which overturns this Court's Opinion and Order and vacates the injunction.

4. The parties agree that if the Navy wishes to seek an alteration to the stipulated operational areas (described in paragraph 5 below) for the final two years of the Final Rule, the parties shall engage in a meet and confer process with the assistance of a court-designated mediator. This meet and confer process shall be subject to the Opinion and Order and any subsequent relevant opinions, orders, or other applicable authority. No later than April 1, 2005, the parties agree to submit a joint status report to the Court stating whether there is a need for a further meet and confer process. The parties agree to complete this meet and confer process no later than August 1, 2005. If the meet and confer process does not yield an agreement, any party may apply to the Court for resolution of the dispute.

5. The parties agree that the attached maps and associated text describing coordinates and seasonal restrictions (Tabs 1, 2, 3, 4) will govern operations of SURTASS LFA sonar under the current Letters of Authorization ("LOAs") or any future LOAs issued during the pendency of the Stipulation until one of the events described in paragraphs 3 and 4 above occurs. The associated map text reflects the following coastal exclusion zones wherein received sound pressure levels shall not exceed 180 dB: (a) for the Stipulated Area within the Philippine Sea, a coastal exclusion zone of at least 60 nautical miles or 30 nautical miles seaward of the 200 meter isobath, whichever is greater, except for waters adjacent to Taiwan, which shall be subject to "(b)" below; and (b) for all other areas, a coastal exclusion zone of at least 30 nautical miles. In the event of a discrepancy between the maps in Tabs 1 through 4 and the associated map text, the associated text controls. Likewise, in the event of a discrepancy between this paragraph's description of the associated map text ((5)(a) and (b) above) and the map text itself, the map text controls. The parties agree that the Navy shall also observe a coastal exclusion zone of 30 nautical miles around any islands occurring within the stipulated areas of operation.

6. The Navy agrees that if SURTASS LFA sonar transmissions are delayed or suspended as a result of the detection by the HF/M3 sonar, passive sonar, or visual observation within the 180 dB plus the one-kilometer buffer zone, as set forth in 50 C.F.R. § 216.184(b), of a marine mammal, sea turtle, or other marine species, transmissions will not resume until 15 minutes after there are no further detections by the HF/M3 sonar or by visual observations of the marine mammal, sea turtle, or other marine species within the 180 dB plus the one-kilometer buffer zone.

7. The parties agree that the Navy is not required to conduct "pre-operation surveys," as described in the Opinion and Order, for the duration of this Stipulation.

8. Operation of SURTASS LFA pursuant to this Stipulation shall remain subject to the applicable Letters of Authorization issued by the National Marine Fisheries Service. In the event of a conflict between this Stipulation and any Letter of Authorization, the more restrictive condition, provision, or requirement will apply.

9. This Stipulation shall not be deemed a waiver by either party of the right to claim or oppose attorney's fees.

10. This Stipulation is not to be construed as a concession by either party as to (a) the potential impacts on marine mammals or other animals of operating SURTASS LFA sonar, (b) the absence or presence of marine mammals or other animals in any areas depicted on the attached maps, or (c) the validity of any other fact or legal position concerning the claims or defenses in this action.

11. Nothing in this Stipulation shall prevent any party from returning to the Court at any time to seek relief from its terms.

SO STIPULATED.

Respectfully stipulated to and submitted this 8th day of October 2003,

THOMAS L. SANSONETTI
Assistant Attorney General
Environment and Natural Resources Division

JEAN WILLIAMS, Chief
Wildlife and Marine Resources Section

Kristen L. Gustafson

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SO STIPULATED.

Respectfully stipulated to and submitted this 8th day of October 2003,

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Attorneys for Plaintiffs

The terms of the above Stipulation are hereby approved and so ORDERED.

Dated: October 14, 2003

Magistrate Judge Elizabeth D. LaPorte

PROOF OF SERVICE

I declare that I am employed with the law firm of Morrison & Foerster LLP, whose address is 425 Market Street, San Francisco, California 94105. I am not a party to the within cause and am over the age of eighteen years.

On October 8, 2003, I caused to be served a true copy of the within:

STIPULATION REGARDING PERMANENT INJUNCTION

☒ BY FACSIMILE AND UPS OVERNIGHT DELIVERY

addressed to the following persons:

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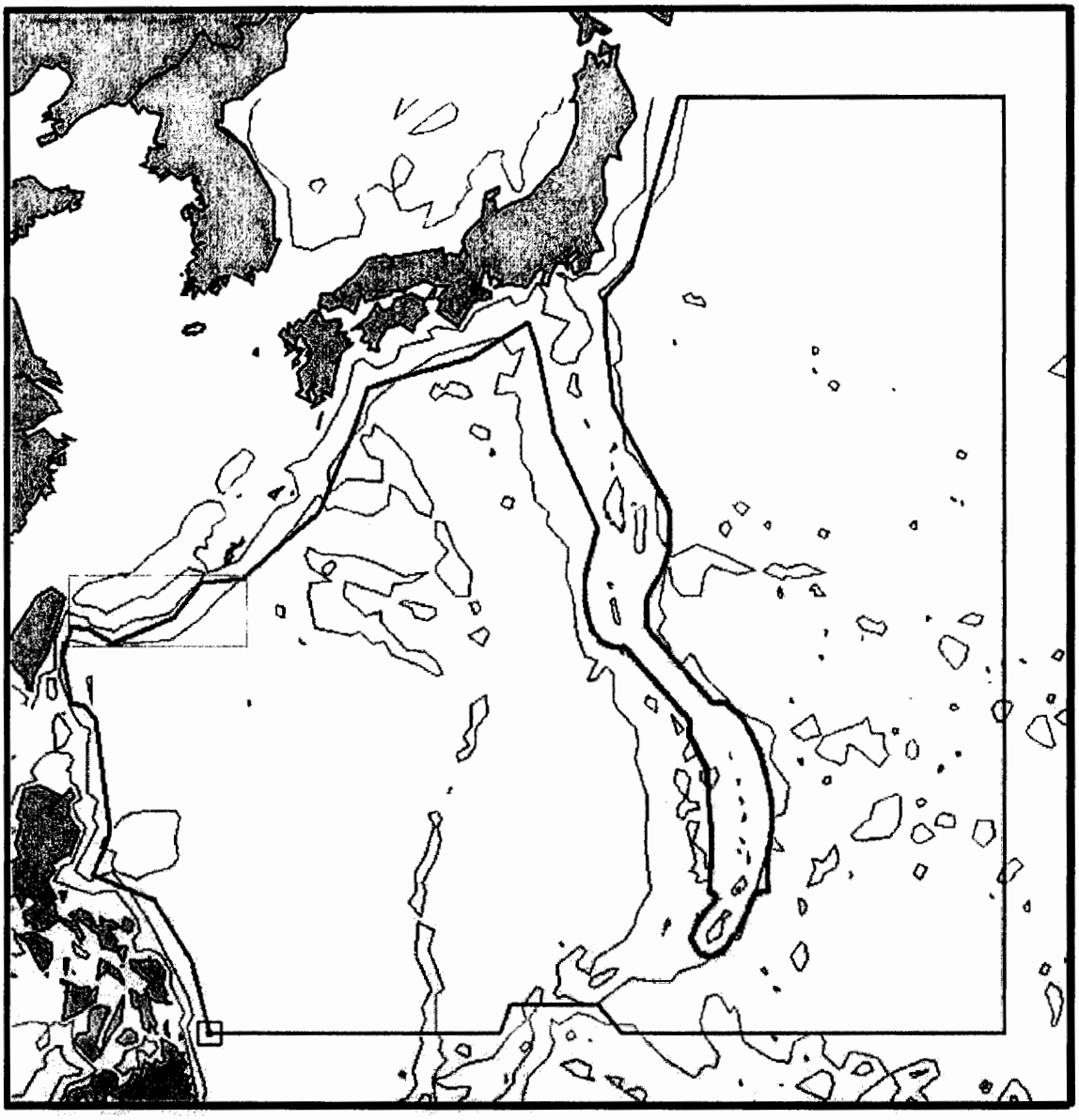
I declare under penalty of perjury under the laws of the State of California that the above is true and correct.

Executed at San Francisco, California, this 8th day of October 2003.

Millie Calvo
(typed)

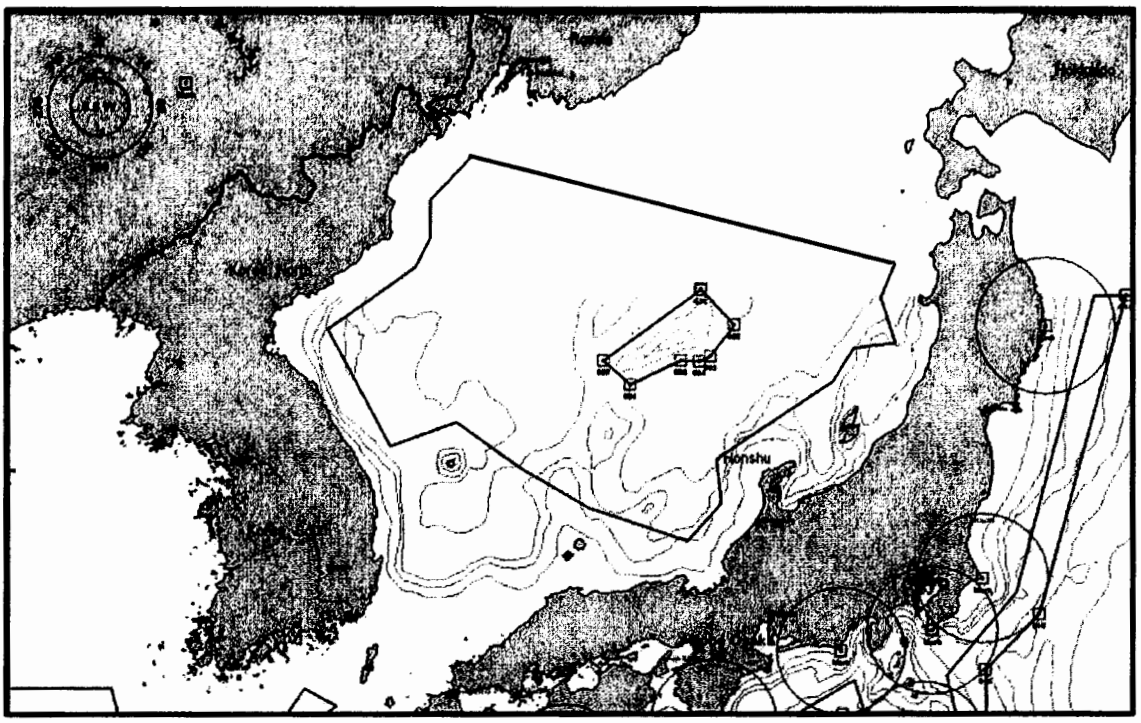
Millie Calvo
(signature)

Philippine Sea Area



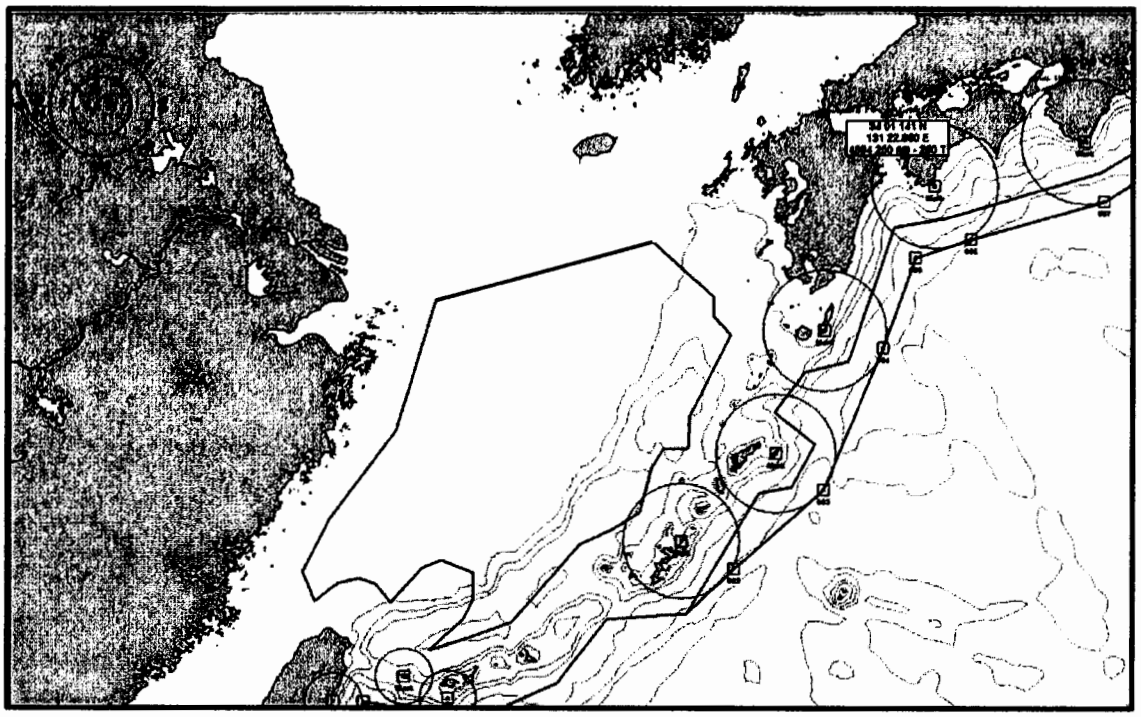
Posit #	Latitude	Longitude	Posit #	Latitude	Longitude
Philippine Sea Year-Round					
1	10 00.0 N	127 09.5 E	19	31 34.6 N	132 38.6 E
2	10 00.0 N	137 16.0 E	20	30 05.1 N	132 02.4 E
3	11 00.0 N	137 37.0 E	21	27 41.6 N	130 54.9 E
4	11 00.0 N	140 44.6 E	22	25 33.5 N	128 19.4 E
5	10 00.0 N	141 31.9 E	23	25 26.9 N	126 48.3 E
6	10 00.0 N	155 00.0 E	24	24 19.4 N	125 50.8 E
7	40 00.0 N	155 00.0 E	25	23 26.6 N	123 42.3 E
8	40 00.0 N	143 32.7 E	26	23 53.4 N	122 53.3 E
9	35 09.6 N	141 55.4 E	27	24 01.3 N	122 15.8 E
10	34 17.2 N	140 55.2 E	28	23 02.2 N	121 56.4 E
11	33 06.7 N	140 58.4 E	29	21 29.7 N	122 13.8 E
12	31 02.2 N	141 17.3 E	30	21 22.6 N	122 39.9 E
13	28 24.4 N	142 52.1 E	31	20 55.4 N	123 04.8 E
14	27 01.8 N	140 47.1 E	32	17 03.5 N	123 35.4 E
15	30 10.7 N	139 10.3 E	33	15 33.5 N	123 01.2 E
16	32 45.7 N	138 35.4 E	34	14 41.2 N	125 07.0 E
17	33 34.3 N	138 14.5 E	35	12 31.1 N	126 28.9 E
18	32 29.3 N	136 12.3 E			
Philippine Sea Exclusion Zone Restricted					
1	28 49.9 N	141 53.9 E	20	12 40.5 N	144 35.8 E
2	28 24.0 N	142 52.8 E	21	12 52.2 N	144 14.9 E
3	27 39.4 N	143 15.9 E	22	13 19.9 N	144 01.1 E
4	26 33.3 N	143 16.6 E	23	13 57.6 N	144 15.4 E
5	25 51.3 N	142 57.4 E	24	14 45.4 N	145 01.0 E
6	24 54.2 N	142 22.7 E	25	15 00.0 N	144 37.4 E
7	24 22.9 N	142 26 2 E	26	16 44.9 N	144 46.6 E
8	23 57.5 N	142 24.2 E	27	19 17.6 N	144 31.1 E
9	21 26.0 N	144 44.6 E	28	20 15.0 N	144 00.7 E
10	21 24.5 N	145 13.5 E	29	20 32.5 N	143 56.1 E
11	21 01.1 N	145 43.5 E	30	20 50.2 N	143 59.3 E
12	19 55.5 N	146 21.7 E	31	23 20.0 N	141 41.6 E
13	18 14.8 N	146 46.6 E	32	23 19.3 N	141 18.8 E
14	17 33.4 N	146 49.8 E	33	23 31.0 N	140 50.2 E
15	16 30.0 N	146 42.4 E	34	23 55.9 N	140 31.0 E
16	15 00.0 N	146 43.0 E	35	24 51.7 N	140 15.3 E
17	14 51.2 N	146 13.5 E	36	25 39.0 N	140 18.3 E
18	13 47.4 N	145 44.3 E	37	27 10.0 N	140 44.8 E
19	12 50.1 N	145 04.4 E	38	28 50.0 N	141 53.9 E

Sea of Japan Area



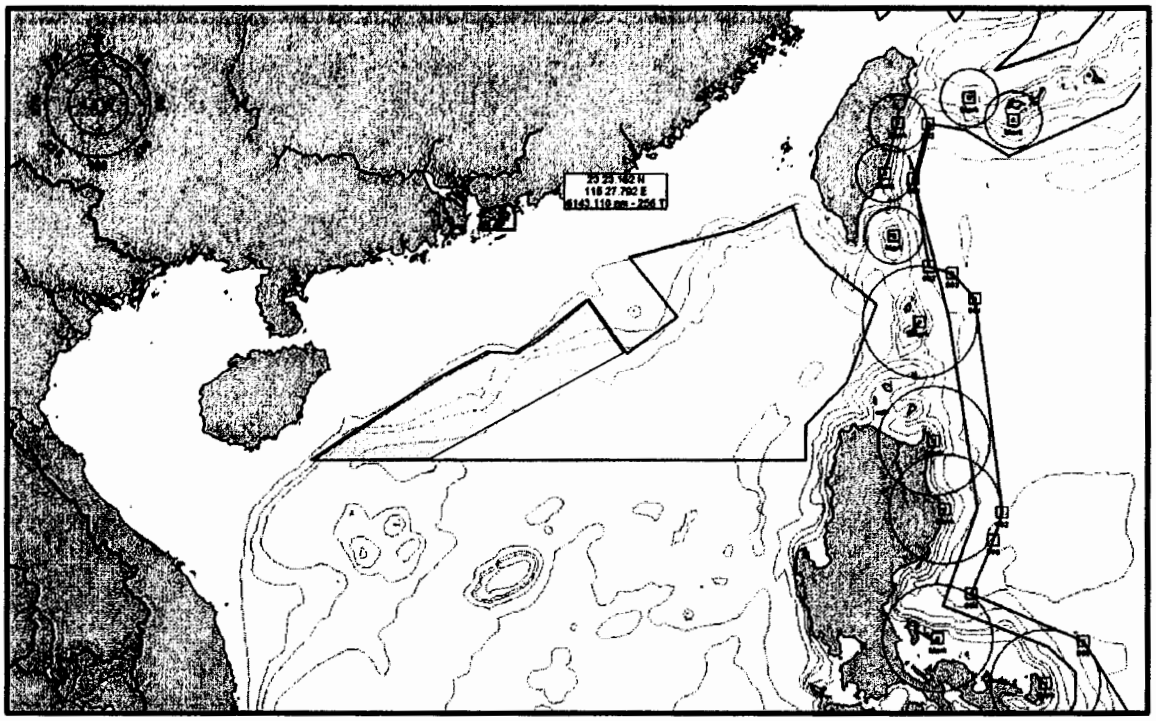
Posit #	Latitude	Longitude	Posit #	Latitude	Longitude
Sea of Japan Restricted May thru July			Yamato Rise Restricted		
1	42 00.0 N	131 14.9 E	1	40 05.9 N	135 31.3 E
2	40 28.7 N	139 10.7 E	2	39 34.0 N	136 12.0 E
3	39 58.3 N	138 57.5 E	3	39 06.0 N	135 45.4 E
4	39 18.1 N	139 13.9 E	4	39 01.9 N	135 32.9 E
5	39 13.4 N	138 27.5 E	5	39 02.4 N	135 11.6 E
6	38 43.6 N	138 03.1 E	6	38 41.8 N	134 15.0 E
7	37 33.6 N	135 51.5 E	7	39 01.9 N	133 42.9 E
8	36 53.0 N	135 57.6 E			
9	36 18.2 N	135 19.2 E			
10	36 48.9 N	133 27.8 E			
11	37 24.1 N	132 13.0 E			
12	38 07.6 N	130 57.8 E			
13	37 45.7 N	129 43.1 E			
14	39 31.2 N	128 33.2 E			
15	40 25.3 N	130 12.2 E			
16	40 51.4 N	130 28.4 E			
17	41 24.1 N	130 28.9 E			

East China Sea Area



Posit #	Latitude	Longitude	Posit #	Latitude	Longitude
East China Sea Year-Round					
1	31 49.2 N	127 40.3 E	15	25 27.9 N	124 05.0 E
2	30 55.6 N	128 50.1 E	16	25 48.9 N	124 15.8 E
3	30 36.6 N	128 49.5 E	17	26 16.2 N	124 14.7 E
4	30 18.0 N	129 09.4 E	18	26 29.1 N	123 39.5 E
5	28 56.1 N	128 22.3 E	19	26 20.4 N	123 17.6 E
6	28 23.6 N	128 20.8 E	20	25 44.5 N	122 42.6 E
7	28 23.2 N	127 52.5 E	21	26 03.9 N	122 25.3 E
8	28 03.7 N	127 38.8 E	22	26 10.2 N	122 06.9 E
9	27 18.5 N	127 25.9 E	23	26 04.6 N	121 42.8 E
10	27 00.5 N	126 53.1 E	24	25 46.3 N	121 17.3 E
11	26 45.7 N	126 17.0 E	25	26 16.9 N	121 03.3 E
12	25 24.0 N	124 59.3 E	26	27 11.8 N	121 33.8 E
13	25 08.7 N	124 14.0 E	27	28 41.6 N	122 47.9 E
14	24 54.1 N	123 25.7 E	28	30 54.3 N	123 33.5 E

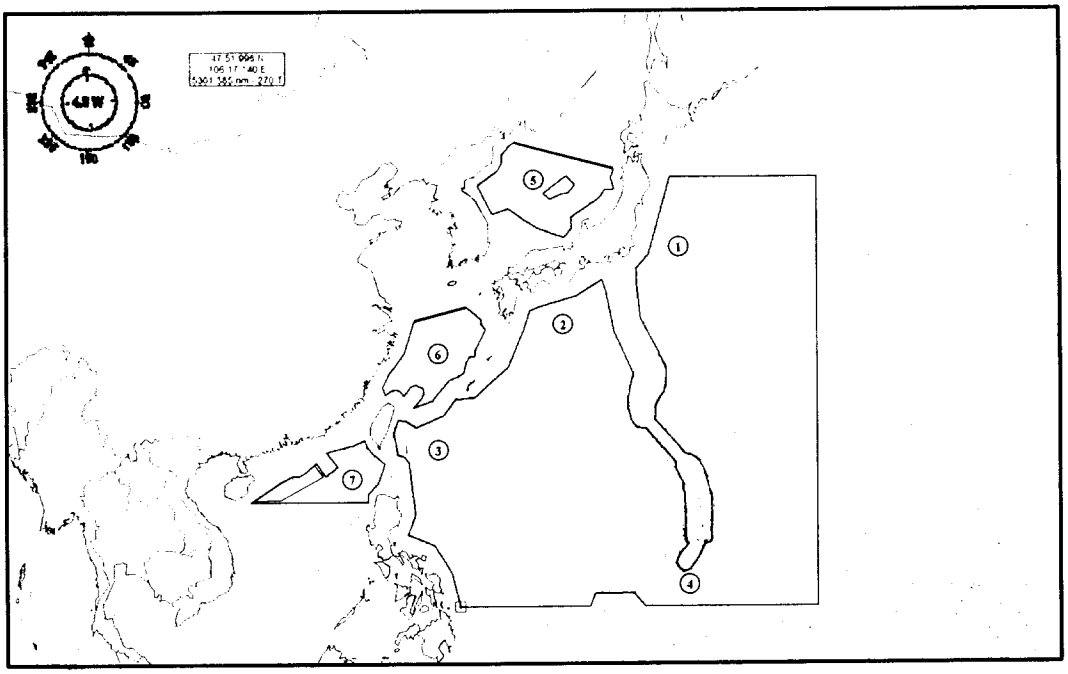
South China Sea Area



Posit #	Latitude	Longitude	Posit #	Latitude	Longitude
South China Sea Year-Round			South China Sea Restricted Nov thru Apr		
1	18 00.0 N	119 56.4 E	2A	18 00.0 N	112 58.9 E
2A	18 00.0 N	112 58.9 E	2	18 00.0 N	110 43.5 E
8	19 55.9 N	116 35.5 E	3	19 30.2 N	113 06.3 E
9	20 35.8 N	117 32.2 E	4	19 58.1 N	114 03.7 E
10	21 40.2 N	116 38 4 E	5	19 56.0 N	114 32.1 E
11	22 10.8 N	118 46.4 E	6	20 14.3 N	115 02.9 E
12	22 34.1 N	119 41.6 E	7	20 54.1 N	115 53.2 E
13	22 23.4 N	119 44.7 E	8	19 55.9 N	116 35.5 E
14	22 00.9 N	119 51.6 E			
15	21 32.9 N	120 17.7 E			
16	20 49.5 N	121 15.1 E			
17	19 24.2 N	120 42.2 E			
18	18 39.4 N	119 57.2 E			

Enclosure (2)
North Pacific Ocean Mission Areas and Boundary Conditions – R/V *Cory Chouest* and USNS IMPECCABLE Combined Planned Mission Areas for 3rd Year LOAs

Mission Areas and Sites



Mission Area Boundary Conditions

Mission Area	Site	Boundary Conditions
Stipulated East of Japan	1	Conduct ops at least 30 nm offshore. From May through November, for ops north of 34 N, remain in waters deeper than 3000 meters or at least 30 nm offshore, whichever is a greater distance offshore, due to presumed beaked whale habitat.
Stipulated North Philippine Sea	2	Conduct ops at least 60 nm offshore or 30 nm seaward of the 200-m isobath.
Stipulated West Philippine Sea	3	From December through April, conduct ops in waters offshore of the 5000 meter isobath or 60 nm offshore, whichever is a greater distance offshore, due to presumed humpback whale breeding/calving areas in shallow, near-shore waters. During other months, conduct ops at least 60 nm offshore or 30 nm seaward of the 200-m isobath.
Stipulated Guam	4	Conduct ops at least 30 nm offshore.
Sea of Japan	5	Conduct all ops in waters deeper than 1000 meters or at least 30 nm offshore, whichever proves the greatest distance offshore, and avoid the Yamato Rise due to presumed beaked whale habitat. This also addresses presumed gray whale migration activity in shallow, near-shore waters during January, March and December.
East China Sea	6	Conduct all ops at least 30 nm offshore, which addresses presumed gray whale migration activity December through March in shallow near-shore waters; and presumed humpback whale breeding/calving activity in shallow, near-shore waters of Okinawa and Miyako Retto Islands December through April. For ops December through March remain southeast of line between 34N/126E and 30N/122E due to presumed gray whale migration activity.
South China Sea	7	Conduct all ops at least 30 nm offshore, which addresses presumed gray whale migration activity in shallow, near-shore waters and presumed gray whale breeding/calving activity in shallow, near-shore waters of Hainan Island; and presumed humpback whale breeding/calving activity in shallow, near-shore waters of Batan and Babuyan Islands in the Luzon Strait.

Enclosure (3):
Background for Marine Mammal Density and Stock Estimates for SURTASS LFA LOA-3

Stipulation Area #1 (East of Japan)/Summer

Specific Species Information:

blue whale: No density or stock estimate data are available for this region. Stafford et al. (2001) studied the geographic variation of blue whale calls in the North Pacific. While there was no hydrophone coverage in the mid-latitudes off Japan, there was some coverage near the Kamchatka peninsula and along the western Aleutian Islands chain. All calls recorded on these hydrophones were northwest Pacific blue whale calls. Based on these data, it was decided that the best available data on blue whales are from sighting surveys associated with Japanese whaling (Tillman 1977). Limited data have been reported on blue whales since this species was the initial focus of whaling effort; therefore, data on fin whales are most appropriate to apply to blue whales. These data are comparable to density estimates in offshore areas of the eastern tropical Pacific (Ferguson and Barlow 2001, 2003).

fin whale: Fin whales migrate south in the winter to about 20°N, and are found in the summer from a line near Japan north to the Chukchi Sea and Aleutian Islands (Evans 1987). Density and stock estimates were derived from encounter rates of Japanese scouting boats in the northwest Pacific (Masaki, 1977; Ohsumi, 1977; Tillman, 1977). These data are comparable to density estimates in offshore areas of the eastern tropical Pacific (Ferguson and Barlow 2001, 2003).

sei whale: Ohsumi (1977) derived abundance estimates of sei/Bryde's whale in the North Pacific in 10° longitude by 5° latitude bins based on catch statistics. Masaki (1977) summarized whale sighting data obtained from scouting boats belonging to Japanese whaling expeditions. These data provide encounter rates and effective search widths from which a density estimate was derived. Abundance estimates came from the same data (Masaki, 1977).

Bryde's whale: Yoshida and Kato (1999) identified 3 stocks of Bryde's whales in western North Pacific: Solomon Islands/Southeast Asia, East China Sea, and offshore western North Pacific. Density estimate derived from scouting vessels sighting data (Ohsumi, 1977). IWC website is source of stock estimate for western North Pacific stock (22,000). Ohizumi et al. (2002) conducted winter sighting surveys, observing Bryde's whales at about 20°N, which is the southern limit of their summer range.

minke whale: Minke whales are found along the south coast of Honshu and Shikoku which were whaling grounds (Ohsumi, 1978). Minke whales are migratory from offshore western North Pacific waters. Buckland et al. (1992) conducted sighting surveys in July and August in western North Pacific and Sea of Okhotsk. Density estimates were derived from encounter rate and effective search width for offshore population (Standard Error (SE) = 0.17). The IWC website shows the source of stock estimate for western North Pacific/Sea of Okhotsk stock (25,000). Ferguson and Barlow (2001, 2003) computed density estimates in offshore areas of the eastern tropical Pacific an order of a magnitude lower.

North Pacific right whale: The western North Pacific right whale population is considered distinct from the eastern population, arbitrarily separated by the 180° line of longitude (Best et al. 2001). The Okhotsk Sea, Kuril Islands, and eastern Kamchatka coast represent major feeding grounds for the western population (Brownell et al. 2001) where animals are typically found May through September (Clapham et al. 2004). Various areas have been proposed for breeding and calving grounds, including the Ryukyu Islands, Yellow Sea, Sea of Japan, offshore waters far from land, and the Bonin Islands, but a lack of winter sightings (Dec-Feb) makes a definitive assessment impossible (Brownell et al. 2001). Clapham et al. (2004) note the extensive offshore component to the right whale's distribution in the 19th century data. Movement north in spring (peak months of Feb-Apr) and south in fall (peak months Sep-Dec) suggest the possibility of two putative sub-populations in the western population that are kept apart by the Japanese islands, though this seems unlikely (Brownell et al. 2001, Clapham et al. 2004). Data from Japanese

sighting cruises in the Okhotsk Sea provide an abundance estimate of 922 animals (CV=0.433, 95% CI=404-2,108) (Best et al. 2001) for the western North Pacific population. The western population may be impacted by proposed LFA operations in the spring and fall in the areas east of Japan.

sperm whale: One stock recognized in U.S. EEZ waters is that of the North Pacific stock of sperm whales. Preliminary data indicate best abundance estimate for the western North Pacific is 102,112 (CV=0.155) (Angliss and Lodge, 2002). Sightings collected by Kasuya and Miyashita (1988) suggest that in the summer, the density of sperm whales is high south of the Kuroshio Current System (south of approximately 35°N), but extremely low north of 35°N. Their data suggest that there are two stocks of sperm whales, a northwestern stock with females that summer off the Kuril Islands and winter off Hokkaido and Sanriku, and the southwestern North Pacific stock with females that summer in the Kuroshio Current System and winter around the Bonin Islands. The males of these two stocks are found north of the range of the corresponding females, i.e., in the Bering Sea and in the Kuril Islands/Sanriku/ Hokkaido, respectively, during the summer. Therefore, this site (35°N) in summer is located on the northern edge of the concentration of southwest females. As such, the density estimate is considered comparable to Mobley's estimate (0.0010/km^2) where sperm whales were generally seen in the outer 5% of his survey effort (Mobley et al., 2000). This is also comparable to the density estimate (0.0029/km^2) calculated from the summer/fall survey off Hawaii in 2002 (Barlow 2003).

Kogia: Evans (1987) reported records of *Kogia* spp. off the Japanese coast with primarily an oceanic distribution. Kogia are not believed to be concentrated anywhere. Summing the abundances of *Kogia* spp. in the geographic strata defined by Ferguson and Barlow (2001), an overall abundance of 166,553 animals is computed in the eastern tropical Pacific. At this northern latitude, the only species expected is the *Kogia breviceps*. After reviewing density estimates calculated in the eastern Pacific Ocean at about 30° N (Ferguson and Barlow 2003), a density estimate of 0.0031 animals/km^2 was modeled.

Cuvier's beaked whale: No density or stock estimate data are available for this region. Considering habitat preferences (e.g., water temperature, bathymetry) it was determined that best data available are the long-term time series from the eastern tropical Pacific (Ferguson and Barlow 2003): density estimate (0.0054/km^2) and abundance estimate of 90,725 animals.

Baird's beaked whale: Kasuya (1986) reported the presence of Baird's beaked whales off the east coast of Japan, as did Leatherwood and Reeves (1983). Miyazaki et al. (1987) did not report any Baird's beaked whale strandings along the Pacific coast of Japan. Ohizumi et al. (2003) examined the stomach content of Baird's whales caught off the east coast of Japan, and reported that the observed prey species were demersal fish that were identical to those caught in bottom-trawl nets at depths greater than 1000 m. Kasuya (1986) collected aerial survey sighting records over 25 years and shipboard sightings in 1984 off the Pacific coast of Japan. Based on his encounter rate and effective search width, derived summer density estimate of 0.0029/km^2 was calculated. Kasuya's (1986) abundance estimate of 4220 (CV=0.295) covered the region from about 32-40°N and seaward of the Pacific Japanese coast out to about 150°E. Since his surveys did not include habitat further north, the stock estimate is increased to 8,000 to account for unsurveyed areas.

Hubbs' beaked whale: Miyazaki et al. (1987) reported five strandings of Hubbs' beaked whales along the Pacific coast of northern Honshu. A a cold temperate species, Leatherwood and Reeves (1983) suggested that its southern limit in the western North Pacific is the warm Kuroshio Current, while its northern limit might be the cold Oyashio Current. Since no data on density or stock estimates are available for this species, it is roughly estimated that the data on *Mesoplodon* spp. from the eastern tropical Pacific (Ferguson and Barlow, 2001; 2003) is appropriate. Using the northernmost strata, the density estimate is 0.0005 animals/km^2 and the abundance estimate is 22,799 animals.

ginkgo-toothed beaked whale: Miyazaki et al. (1987) reported 5 strandings of *M. ginkgodens* from the east coast of Japan. Of the 15 known strandings of *M. ginkgodens* , Palacios (1996) reported 8 strandings off Taiwan and Japan. Since no data on density or stock estimates are available for this species, it is roughly estimated that the data on *Mesoplodon* spp. from the eastern tropical Pacific (Ferguson and Barlow, 2001; 2003) is appropriate. Using the northernmost strata, the density estimate is 0.0005 animals/km^2 and the abundance estimate is 22,799 animals.

false killer whale: Miyashita (1993) estimated abundance of false killer whales from 34 sighting cruises associated with the Japanese drive fishery (16,668 (CV=0.263)). He also derived density estimates in 1° latitude by 1°

longitude boxes from which an average was derived for the modeled site. Kishiro and Kasuya (1993) reviewed the history of Japanese coastal whaling**.**

pygmy killer whale: Kishiro and Kasuya (1993) reviewed the historical catches of Japanese drive fisheries. No pygmy killer whales were caught in Taiji fisheries (located on the south coast of Kii Peninsula of Japan), but Leatherwood and Reeves (1983) reported that they were seen relatively frequently in the tropical Pacific off Japan. Without data available in the western North Pacific, density estimate (0.0021/km^2) and abundance estimate (30,214) from eastern Pacific (Ferguson and Barlow 2003) were used.

melon-headed whale: Leatherwood and Reeves (1983) stated that melon-headed whales are rare except in the Philippine Sea. They are distributed in tropical and subtropical waters, preferring equatorial water masses, they are probably uncommon outside of the warm waters of the Kuroshio Current. With these limited data, a density estimate was used for low-level species (0.0002/km^2), approximately 1/10 of Mobley et al.'s (2000) density estimate for Hawaii waters; and abundance estimate of 12,000 (approximately 1/3 of the ETP abundance estimate (36,770) (Ferguson and Barlow, 2003) were used.

short-finned pilot whale: Miyashita (1993) estimated the abundance of short-finned pilot whales from 34 sighting cruises associated with the Japanese drive fishery (53,608 (CV=0.224)). He also derived density estimates in 1° latitude by 1° longitude boxes, from which an average density estimate was derived for the modeled site. Kasuya et al. (1988) suggested that there might be more than one stock of short-finned pilot whales off the Pacific coast of Japan and Taiwan since there is a southern form found south of the Kuroshio Current front (south of 35° N) and a northern form found between the Kuroshio Current front and the Oyashio Current front (from approximately 35-43° N). Miyashita (1993) questioned whether the entire range consisted of a single stock or population, but had no way of delineating the data. However, the northern form has not been harvested by Japanese drive fisheries (Kishiro and Kasuya, 1993), and it therefore was not included in the above analyses (Miyashita, 1993).

Fraser's dolphin: A highly gregarious species, groups of a hundred to a thousand Fraser's dolphins have been observed; occasionally found mixed in herds of spotted dolphins, and observed in company of false killer whales, sperm whales, striped dolphins, and spinner dolphins. Their diet consists of squid, crustaceans, and deep-sea fish. They are a tropical, pelagic species (Leatherwood and Reeves, 1983). Kishiro and Kasuya (1993) reported catches off the Pacific coast of Japan in drive fisheries. Dolar et al. (2003) report Fraser's and spinners found together in the eastern Sulu Sea, Philippines; comparing feeding ecology of spinner and Fraser's dolphins, spinner feed primarily in upper 200 m, but maybe as deep as 400 m whereas Fraser's are more diverse, feeding from the surface to as deep as 600 m. Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that the data from the eastern tropical Pacific (Ferguson and Barlow, 2001; 2003) is appropriate.

common dolphin: There are no data on density or stock estimates in the western Pacific (Miyashita, 1993). A gregarious species, it is not unusual to find them associated with Pacific white-sided dolphins in eastern North Pacific feeding grounds. They are typically pelagic, offshore, encountered along or seaward of the 183-m (100-fm) contour in waters of temperature 10-28° C. They are very widely distributed, occurring in all oceans to the limits of tropical and warm temperate waters (Leatherwood and Reeves, 1983). Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that the data from the eastern tropical Pacific (Ferguson and Barlow, 2001; 2003) is appropriate.

bottlenose dolphin: Miyashita (1993) estimated the abundance of bottlenose dolphins to be (168,791 (CV=0.261)). The density is estimated for the Pacific coast of Japan (0.0171/km^2).

rough-toothed dolphin: Their distribution primarily pelagic, in tropical to warm temperate waters. They are seen from time to time with bottlenose dolphins and short-finned pilot whales. Reportedly they are rare off Japan and in the heavily studied eastern tropical Pacific. There are no data on stock or density estimates for the western North Pacific; therefore, density (0.0059/km^2) and abundance (145,729) estimates from eastern Pacific waters were used (Ferguson and Barlow 2001, 2003)**.**

Risso's dolphin: Miyashita (1993) western North Pacific stock estimate (83,289 (CV=0.179)) and density estimates are derived for Pacific coast of Japan.

Pacific white-sided dolphin: No data on density or stock estimates exist for this species (Miyashita, 1993). They are a gregarious species. They are typically pelagic, offshore, and encountered along or seaward of the 183-m (100-fm) contour. They feed at night on deep-scattering layer. Pacific white-sided dolphins are primarily temperate distribution, found north of tropical waters and south of arctic waters (Leatherwood and Reeves, 1983). Density (0.0082/km^2) and abundance (100,757) estimates from eastern Pacific waters were used (Ferguson and Barlow 2001, 2003).

spinner dolphin: Gilpatrick et al. (1987) did not report any sightings from the Pacific coast of Japan and are not mentioned in historical Japanese whaling records (Kishiro and Kasuya, 1993) and therefore, there are no data on density or stock estimates (Miyashita, 1993). Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that the data from the eastern tropical Pacific (Ferguson and Barlow, 2001; 2003) is appropriate.

pantropical spotted dolphin: Gilpatrick et al. (1987) cited a known distribution of pantropical spotted dolphins east of Japan. Miyashita (1993) estimated the abundance (438,064 (CV=0.174)). Density is estimated east of Japan (0.0259/km^2).

striped dolphin: There are two concentrations in western North Pacific, one south of 30° N and the other in the offshore waters north of 30° N, with the potential for three populations in the area (one south of 30° N, one inshore north of 30° N, one offshore north of 30° N, east of 145° E) though the boundaries between these populations has not been resolved (Miyashita, 1993). Therefore, Miyashita (1993) derived total population estimate (570,038 (CV=0.186)). Density estimates for Pacific coast of Japan were used for this site (0.0111/km^2).

Stipulation Area #2 (North Philippine Sea)/Winter

Specific Species Information:

minke whale: The south coast of Honshu and Shikoku were whaling grounds (Ohsumi, 1978). Minke whales are migratory from offshore western North Pacific waters. Buckland et al. (1992) conducted sighting surveys in July and August in western North Pacific and Sea of Okhotsk. Density estimates were derived from encounter rate and effective search width for offshore population (Standard Error (SE) = 0.17). The IWC website is the source of the stock estimates for western North Pacific/Sea of Okhotsk stock (25,000). Ferguson and Barlow (2001, 2003) computed density estimates in offshore areas of the eastern tropical Pacific an order of a magnitude lower.

Bryde's whale: Yoshida and Kato (1999) identified 3 stocks of Bryde's whales in western North Pacific: Solomon Islands/Southeast Asia, East China Sea, and offshore western North Pacific. Density estimate derived from scouting vessels sighting data (Ohsumi, 1977). The IWC website is the source for the stock estimates for the western North Pacific stock (22,000). Ohizumi et al. (2002) conducted winter sighting surveys, observing Bryde's whales at about 20°N, which is the southern limit of their summer range.

North Pacific right whale: The western North Pacific right whale population is considered distinct from the eastern population, arbitrarily separated by the 180° line of longitude (Best et al. 2001). The Okhotsk Sea, Kuril Islands, and eastern Kamchatka coast represent major feeding grounds for the western population (Brownell et al. 2001) where animals are typically found May through September (Clapham et al. 2004). Various areas have been proposed for breeding and calving grounds, including the Ryukyu Islands, Yellow Sea, Sea of Japan, offshore waters far from land, and the Bonin Islands, but a lack of winter sightings (Dec-Feb) makes a definitive assessment impossible (Brownell et al. 2001). Clapham et al. (2004) note the extensive offshore component to the right whale's distribution in the 19th century data. Movement north in spring (peak months of Feb-Apr) and south in fall (peak months Sep-Dec) suggest the possibility of two putative sub-populations in the western population that are kept apart by the Japanese islands, though this seems unlikely (Brownell et al. 2001, Clapham et al. 2004). Data from Japanese sighting cruises in the Okhotsk Sea provide an abundance estimate of 922 animals (CV=0.433, 95% CI=404-2,108) (Best et al. 2001) for the western North Pacific population. The western population may be impacted by proposed LFA operations in the spring, fall and winter northern Philippine Sea.

sperm whale: There is one stock of sperm whales recognized in U.S. EEZ waters which is the North Pacific stock of sperm whales. Preliminary data indicate best abundance estimate for the western North Pacific is 102,112 (CV=0.155) (Angliss and Lodge, 2002). Sightings collected by Kasuya and Miyashita (1988) suggest that that there are two stocks of sperm whales, a northwestern stock with females that summer off the Kuril Islands and winter off Hokkaido and Sanriku, and the southwestern North Pacific stock with females that summer in the Kuroshio Current System and winter around the Bonin Islands. The males of these two stocks are found north of the range of the corresponding females, i.e., in the Kuril Islands/Sanriku/Hokkaido and in the Kuroshio Current System, respectively, during the winter. Therefore, this site (29° N) in winter is located on the northern edge of the concentration of southwest females. As such, the density estimate is considered comparable to Mobley's estimate (0.0010/km^2) where sperm whales were generally seen in the outer 5% of survey effort (Mobley et al., 2000) and 0.0029/km^2 from Barlow (2003).

Kogia: Evans (1987) reported records of *Kogia* spp. off the Japanese coast with primarily an oceanic distribution. They are not believed to be concentrated anywhere. Summing the abundances of *Kogia* spp. in the geographic strata defined by Ferguson and Barlow (2001), an overall abundance of 166,553 animals is computed in the eastern tropical Pacific. *Kogia breviceps* is the only species expected at this northern latitude. Density estimates calculated in the eastern Pacific Ocean at about 30° N (Ferguson and Barlow 2003) has been reviewed, a density estimate of 0.0031 animals/km^2 and an abundance estimate of 166,553 was modeled.

ginkgo-toothed beaked whale: Miyazaki et al. (1987) reported 5 strandings of *M. ginkgodens* from the east coast of Japan and 2 strandings from the east coast of Taiwan. Of the 15 known strandings of *M. ginkgodens* , Palacios (1996) reported 8 strandings off Taiwan and Japan. Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that the data on *Mesoplodon* spp. from the eastern Pacific (Ferguson and Barlow, 2001; 2003) is appropriate.

Blainville's beaked whale: Miyazaki et al. (1987) reported 2 strandings on Taiwan and one stranding on the southern Ryukyu Archipelago. Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that the data from the eastern tropical Pacific (Ferguson and Barlow, 2001; 2003) is appropriate. The *Mesoplodon densirostris* estimate added to one-fifth of the *Mesoplodon* spp. abundance estimate and is 8,032.

Cuvier's beaked whale: No density or stock estimate data are available for this region. Considering habitat preferences (e.g., water temperature, bathymetry), it was determined that best data available are a density estimate (0.0054/km^2) and an abundance estimate of 90,725 animals (Ferguson and Barlow 2003).

killer whale: A few schools of killer whales have been seen off the southeast coast of Honshu (off Taiji) in April, October, and November; however, none have been taken in the drive fisheries (Miyashita, 1993). Density estimates (0.0004/km^2) and abundance estimates (12,256) from eastern tropical Pacific (Ferguson and Barlow, 2003) were used.

pygmy killer whale: Kishiro and Kasuya (1993) reviewed the historical catches of Japanese drive fisheries. No pygmy killer whales were caught in Taiji fisheries (located on the south coast of Kii Peninsula of Japan), but Leatherwood and Reeves (1983) reports that they were seen relatively frequently in the tropical Pacific off Japan. Without data available in the western North Pacific, density estimates (0.0021/km^2) and abundance estimates (30,214) from eastern Pacific (Ferguson and Barlow 2003) were used.

false killer whale: Miyashita (1993) estimated the abundance of false killer whales from 34 sighting cruises associated with the Japanese drive fishery (16,668 (CV=0.263)). He also derived density estimates in 1° latitude by 1° longitude boxes from which an average was derived for the modeled site. Kishiro and Kasuya (1993) reviewed the history of Japanese coastal whaling**.**

short-finned pilot whale: Miyashita (1993) estimated the abundance of short-finned pilot whales from 34 sighting cruises associated with the Japanese drive fishery (53,608 (CV=0.224)). He also derived density estimates in 1° latitude by 1° longitude boxes from which an average was derived for the modeled site. Kishiro and Kasuya (1993) reviewed the history of Japanese coastal whaling**.**

bottlenose dolphin: Miyashita's (1993) abundance estimate (168,791 (CV=0.261)) and density estimate off southern Japan (0.0146/km^2) were used for bottlenose dolphins.

Risso's dolphin: Miyashita's (1993) abundance estimate (83,289 (CV=0.179)) and density estimate off southern Japan/east Taiwan (0.0106/km^2) were used for Risso's dolphins.

pantropical spotted dolphin: Gilpatrick et al. (1987) cited a known distribution of pantropical spotted dolphins east of Taiwan and in the Philippine Sea. Miyashita's (1993) abundance estimates (438,064 (CV=0.174)) and density estimates off southern Japan/east Taiwan (0.0137/km^2) were used.

striped dolphin: There are two concentrations of striped dolphins in the western North Pacific, one south of 30N and the other in the offshore waters north of 30N, with the potential for three populations in the area (one south of 30N, one inshore north of 30N, one offshore north of 30N, east of 145E) though the boundaries between these populations has not been resolved (Miyashita, 1993). Therefore, Miyashita (1993) derived the total population estimate (570,038 (CV=0.186)). Density estimate off southern Japan/east Taiwan (0.0329/km^2) were used.

Stipulation Area #3 (West Philippine Sea)/Fall

Specific Species Information:

fin whale: Fin whales winter to about 20°N, including waters along the Pacific coast of Japan. Since fin whales migrate south from offshore waters of the northwest Pacific, density and stock estimates were derived from encounter rates of Japanese scouting boats in the northwest Pacific (Masaki, 1977; Ohsumi, 1977; Tillman, 1977). These data are comparable to density estimates in offshore areas of the eastern tropical Pacific (Ferguson and Barlow 2001, 2003).

Bryde's whale: Animals around the Bonin Islands are an offshore morph of *Balaenoptera edeni*. 3 stocks of this species are recognized in western North Pacific: Solomon Islands/Southeast Asia, East China Sea, and offshore western North Pacific (Yoshida and Kato, 1999). The Ohsumi (1977) density estimate data were used. The IWC website is the source of stock estimate for western North Pacific stock (22,000). Ohizumi et al. (2002) conducted winter sighting surveys, observing Bryde's whales at about 20°N, which is the southern limit of their summer range. Barlow (2003) observed around Hawaiian Islands, deriving comparable density estimate.

minke whale: The south coast of Honshu and Shikoku were whaling grounds for minke whales (Ohsumi, 1978). Minke whales are migratory from offshore western North Pacific waters. Buckland et al. (1992) conducted sighting surveys in July and August in western North Pacific and Sea of Okhotsk. Density estimates were derived from encounter rates and effective search width for offshore population (Standard Error (SE) = 0.17). The IWC website is the source of stock estimate for western North Pacific/Sea of Okhotsk stock (25,000). Ferguson and Barlow (2001, 2003) computed density estimates in offshore areas of the eastern tropical Pacific an order of a magnitude lower.

humpback whale: Humpback whales are not expected in the area during spring and therefore, have not been modeled. Humpback wintering grounds in the western North Pacific are the Ryukyu Islands, Formosa and Bonin Islands (Evans, 1987). Three populations of humpbacks are recognized in U.S. EEZ waters, the third being the (quoted from Angliss and Lodge, 2002): "winter/spring populations of Japan which, based on Discovery Tag information, probably migrate to waters west of the Kodiak Archipelago (the Bering Sea and Aleutian Islands) in summer/fall (Berzin and Rovnin 1966, Nishiwaki 1966, Darling 1991) - referred to as the Western North Pacific stock. Some recent exchange between winter/spring areas has been documented (Darling and McSweeney 1985, Baker et al. 1986, Darling and Cerchio 1993), as well as movement between Japan and British Columbia, and Japan and the Kodiak Archipelago (Darling et al. 1996, Calambokidis et al. 1997)." The best abundance estimate for the western North Pacific stock is 394 (CV=0.084) (Angliss and Lodge, 2002).

sperm whale: One stock is recognized in U.S. EEZ waters: the North Pacific stock of sperm whales. Preliminary data indicate best abundance estimate for the western North Pacific is 102,112 (CV=0.155) (Angliss and Lodge, 2002). Sightings collected by Kasuya and Miyashita (1988) suggest that that there are two stocks of sperm whales, a

northwestern stock with females that summer off the Kuril Islands and winter off Hokkaido and Sanriku, and the southwestern North Pacific stock with females that summer in the Kuroshio Current System and winter around the Bonin Islands. The males of these two stocks are found north of the range of the corresponding females, i.e., in the Kuril Islands/Sanriku/Hokkaido and in the Kuroshio Current System, respectively, during the winter. As such, the density estimate is considered comparable to Mobley's estimate (0.0010/km^2) where sperm whales were generally seen in the outer 5% of survey effort (Mobley et al., 2000) and Barlow (2003) estimate of 0.0029/km^2.

Kogia: Evans (1987) reported records of *Kogia* spp. off the Japanese coast with primarily an oceanic distribution. Kogia are not believed to be concentrated anywhere. Summing the abundances of *Kogia* spp. in the geographic strata defined by Ferguson and Barlow (2001), an overall abundance of 166,553 animals is computed in the eastern tropical Pacific. At this latitude, expect *Kogia breviceps* and *Kogia simus*. Reviewing density estimates calculated in the eastern Pacific Ocean at about 20° N (Ferguson and Barlow 2003), a density estimate of 0.0017 animals/km^2 was modeled.

Cuvier's beaked whale: No data are available for Cuvier's beaked whales in this region. Considering habitat preferences (e.g., water temperature, bathymetry), it was determined that the best data available are a density estimate (0.0003/km^2) and an abundance estimate of 90,725 animals from the same latitude in the eastern Pacific (Ferguson and Barlow 2003).

ginkgo-toothed beaked whale: Miyazaki et al. (1987) reported 2 strandings of *M. ginkgodens* from the east coast of Taiwan. Of the 15 known strandings of *M. ginkgodens*, Palacios (1996) reported 8 strandings off Taiwan and Japan. Leatherwood and Reeves (1983) stated that some hunting of this species apparently takes place in Taiwan. Since no data on density or stock estimates are available for this species, it was roughly estimated that the density and abundance estimates for *Mesoplodon* spp. at the same latitude in the eastern Pacific (Ferguson and Barlow 2001, 2003) is approximate.

Blainville's beaked whale: Miyazaki et al. (1987) reported 2 strandings on Taiwan and one stranding on the southern Ryukyu Archipelago. Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that the data from the eastern tropical Pacific (Ferguson and Barlow, 2001; 2003) is appropriate. The *Mesoplodon densirostris* estimate was added to one-fifth of the *Mesoplodon* spp. Abundance and estimated to be 8,032.

false killer whale: Miyashita (1993) estimated abundance of false killer whales from 34 sighting cruises associated with the Japanese drive fishery (16,668 (CV=0.263)). He also derived density estimates in 1° latitude by 1° longitude boxes from which an average was derived for the modeled site. Kishiro and Kasuya (1993) reviewed the history of Japanese coastal whaling**.**

pygmy killer whale: Kishiro and Kasuya (1993) reviewed the historical catches of Japanese drive fisheries. No pygmy killer whales were caught in Taiji fisheries (located on the south coast of Kii Peninsula of Japan), but Leatherwood and Reeves (1983) reported that they were seen relatively frequently in the tropical Pacific off Japan. Without data available in the western North Pacific, the density estimate (0.0021/km^2) and abundance estimate (30,214) from eastern Pacific (Ferguson and Barlow 2003) were used.

melon-headed whale: Leatherwood and Reeves (1983) reported that melon-headed whales are not observed frequently anywhere except in the Philippine Sea, especially near Cebu Island. The density estimate and abundance estimate from the eastern Pacific (Ferguson and Barlow, 2003) were used.

short-finned pilot whale: Miyashita (1993) estimated abundance of short-finned pilot whales from 34 sighting cruises associated with the Japanese drive fishery (53,608 (CV=0.224)). He also derived density estimates in 1° latitude by 1° longitude boxes. There was limited coverage of the Philippine Sea, but Kishiro and Kasuya (1993) reported a southern limit to the short-finned pilot whale range of approximately 20°N; therefore, a density estimate was derived as one-half the density estimate of the area south of Japan. Kasuya et al. (1988) suggests that there might be more than one stock of short-finned pilot whales off the Pacific coast of Japan and Taiwan, since there is a southern form found south of the Kuroshio Current front (south of 35° N) and a northern form found between the Kuroshio Current front and the Oyashio Current front (from approximately 35-43° N). However, the northern form

has not been harvested by Japanese drive fisheries (Kishiro and Kasuya, 1993), and it was therefore not included in the above analyses (Miyashita, 1993).

Fraser's dolphin: Kishiro and Kasuya (1993) reported takes of Fraser's dolphin in the Japanese drive fisheries. Amano et al. (1996) stated that Fraser's dolphins are common in Philippine waters. A highly gregarious species, groups of a hundred to a thousand have been observed. They are occasionally found mixed in herds of spotted dolphins, and observed in company of false killer whales, sperm whales, striped dolphins, and spinner dolphins. Their diet consists of squid, crustaceans, and deep-sea fish. They are a tropical, pelagic species (Leatherwood and Reeves, 1983). Kishiro and Kasuya (1993) reported catches off the Pacific coast of Japan in drive fisheries. Dolar et al. (2003) reported Fraser's and spinners found together in the eastern Sulu Sea, Philippines. Comparing the feeding ecology of spinner and Fraser's dolphins, spinner feed primarily in upper 200 m, but maybe as deep as 400 m whereas Fraser's are more diverse, feeding from the surface to as deep as 600 m. Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that the data from the eastern tropical Pacific (Ferguson and Barlow, 2001; 2003) is appropriate.

common dolphin: There are no data on density or stock estimates (Miyashita, 1993). They are a gregarious species and it is not unusual to find them associated with Pacific white-sided dolphins in eastern North Pacific feeding grounds. They are pelagic, offshore animals, typically encountered along or seaward of the 100-fm contour. Common dolphins are found in waters of temperature 10-28° C, very widely distributed, occurring in all oceans to the limits of tropical and warm temperate waters (Leatherwood and Reeves, 1983). Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that the data from the eastern tropical Pacific (Ferguson and Barlow, 2001; 2003) is appropriate.

bottlenose dolphin: Miyashita (1993) abundance estimate (168,791 (CV=0.261)) and density estimate off southern Japan (0.0146/km^2) were used.

rough-toothed dolphin: Their distribution is primarily pelagic, in tropical to warm temperate waters. They are seen from time to time with bottlenose dolphins and short-finned pilot whales. They are reportedly rare off Japan and in the heavily studied eastern tropical Pacific. No data on stock or density estimates for the western North Pacific; therefore, density estimate (0.0040/km^2) and abundance estimate from ETP (145,729) were used (Ferguson and Barlow 2001, 2003)**.**

spinner dolphin: Gilpatrick et al. (1987) reported a high density of sightings in the Korea Strait. However, none have been reported from the Philippine Sea. Spinner dolphins are mentioned in historical Japanese whaling records (Kishiro and Kasuya, 1993); however, there are no data on density or stock estimates (Miyashita, 1993). Because frequently associated with spotted dolphins in the ETP (Leatherwood and Reeves, 1983), half density and stock estimates for spotted dolphins were used.

pantropical spotted dolphin: Gilpatrick et al. (1987) cited a known distribution of pantropical spotted dolphins east of Taiwan and in the Philippine Sea. Miyashita (1993) abundance estimate (438,064 (CV=0.174)) and density estimate off southern Japan/east Taiwan (0.0137/km^2) were used.

striped dolphin: Two concentrations of striped dolphins in the western North Pacific are known to exist, one south of 30° N and the other in the offshore waters north of 30° N, with the potential for three populations in the area (one south of 30° N, one inshore north of 30N, one offshore north of 30° N, east of 145° E) though the boundaries between these populations has not been resolved (Miyashita, 1993). Therefore, Miyashita (1993) derived total population estimate (570,038 (CV=0.186)). One-half density estimate off southern Japan/east Taiwan for this site (0.0164/km^2) were used.

Risso's dolphin: Miyashita (1993) abundance estimate (83,289 (CV=0.179)) and density estimate off southern Japan/east Taiwan (0.0106/km^2) were used.

Pacific white-sided dolphin: There are no data on density or stock estimates (Miyashita, 1993). They are a gregarious species. Pacific white-sided dolphins are pelagic, offshore and are encountered along or seaward of the 100-fm contour. They feed at night on deep-scattering layer. They have a primarily temperate distribution, found north of tropical waters and south of arctic waters (Leatherwood and Reeves, 1983). Without any data on stock or

density estimates for the western North Pacific, it is roughly estimated that the data from the eastern tropical Pacific (Ferguson and Barlow, 2001; 2003) is appropriate.

Stipulated Area #4 (Guam)/Spring & Summer

General Area Information:

There has been no recent research of marine mammals in the vicinity of Guam (Dr. J. Mobley, Jr., Univ. of Hawaii-West Oahu, pers. comm.). Eldredge (1991) compiled the first list of published and unpublished records, reporting 19 species from the region. Since there are no data on density or stock estimates for animals found in this region, the density and abundance estimates from the NOAA Fisheries Southwest Fisheries Science Center surveys of the eastern tropical Pacific were applied to this area as the best available data (Ferguson and Barlow, 20001; 2003). Guam references: (Kami and Lujan, 1976; Donaldson, 1983; Eldredge, 1991).

Specific Species Information:

Blue whale: A Hawaiian stock of blue whale is recognized for U.S. management purposes, though they are extremely rare in the area (Carretta et al., 2002). It is hypothesized that blue whales that feed along the Aleutian Island chain in the summer spend the winter north of Hawaii, though only one visual sighting of blue whales has been recorded (Carretta et al., 2002). Further evidence of their occurrence in the area exists in acoustic recordings. Stafford et al. (2001) show that recordings made near Kaneohe, Hawaii from August 1992 through April 1993 consisted of approximately 30% of the northwest Pacific blue whale call type and 70% of northeast Pacific call type. Other papers on acoustic censusing of blue whales in eastern North Pacific are Moore et al. (1997) and Stafford et al. (1999). Because of the limited data available for the Hawaiian stock and the current uncertainty in blue whale stock delineation in the North Pacific (IWC recognizes only one stock in North Pacific; NOAA Fisheries delineates two stocks in U.S. EEZ waters, though up to five populations are believed to exist in the entire North Pacific basin (Reeves et al., 1998); and acoustic data suggest two populations), density estimate and stock abundance were derived from data on the eastern North Pacific stock. The density estimate is 0.0002/km^2 and the stock estimate is 4048 (Ferguson and Barlow, 2003).

Fin whale: Fin whales are typically not expected south of 20° N, so it is unlikely that they would be encountered near Guam. A Hawaii stock is recognized (Carretta et al., 2002). There has bee one sighting in Hawaiian waters in recent years (February) (Mobley et al., 1996), and there has been acoustic evidence for presence in fall and winter (Thompson and Friedl, 1982; Moore et al., 1998). Because of the limited data available for the Hawaiian stock, and no data available for the Guam region, density estimate and stock abundance were derived from data on the eastern North Pacific stock (Ferguson and Barlow, 2003). The stock estimate is 1898 for animals outside of the Gulf of California and a density estimate of 0.0002/km^2 based one-half the density offshore of CA/OR/WA. It is conservative to use the eastern North Pacific data because McDonald and Fox (1999) derived an average calling whale density estimate of 0.027 animals per 1000 km^2 (0.000027/km^2) based on recordings made north of Oahu, Hawaii – a value an order of magnitude less than what was modeled. The seasonal maximum calling whale density was about three times the average, or 0.081 animals/1000 km^2 (McDonald and Fox, 1999), still considerably less than the modeled density.

The following table from McDonald and Fox (1999) gives a sense of the variability in the derivation of call density estimates. Based on the chosen methodology and parameters, the call density ranged from 0.011/1000 km^2 to 0.106/1000 km^2.

TABLE I. Relation of average call density estimate to time constant and range (From McDonald and Fox, 1999)

SNR	Range (km)	Number of Detections		Call Density/1000 km^2	
		TC=4h	TC=8h	TC=4h	TC=8h
1.0–1.5	16.0–24.0	143	85	0.042	0.025
1.5–2.5	9.6–16.0	54	36	0.031	0.020
2.5–5.0	4.75–9.6	15	10	0.016	0.011
5.0–10	2.25–4.75	11	8	0.038	0.027
>10	0–2.25	9	7	0.106	0.083
Average Call Density/1000 km^2 Weighted by number of detections				0.040	0.027

Bryde's whale: There is a recognized Hawaiian stock of Bryde's whales (Carretta et al., 2002)**.** There have been no recent observations of Bryde's whales in the region, though historical evidence suggests they might be present (Carretta et al., 2002)**.** Data from the ETP (Ferguson and Barlow, 2003) for stock (5765 animals) and density estimates (0.0009/km^2) were used.

Humpback whale: Humpback whales are not expected during the summer and therefore, are not modeled. Central North Pacific stock identified as individuals that migrate from summer/fall feeding grounds of northern British Columbia and southeast Alaska (Prince William Sound west to Kodiak), to winter/spring breeding and calving grounds of the Hawaiian Islands (Carretta et al., 2002)**.** Some exchange between winter/spring areas has been documented, as well as movement between Japan and British Columbia, and Japan and the Kodiak Archipelago (Calambokidis et al., 1997). Recent acoustic surveys (Norris et al., 1999) suggest a northbound migration heading of approximately magnetic north (10° true), with a "migration corridor" of 150-160° W. Animals are cycling through the breeding grounds with an average residency of approximately 30-45 days. The best abundance estimate for the central North Pacific stock is 4005 (CV=0.095) (Angliss and Lodge, 2002). Mobley et al.'s (2001) aerial surveys observed that 64% of humpback whales were found in waters of depths less than 183 m (100 fm). Density estimate for waters greater than 183 m (100 fm) were derived from survey results.

Minke whale: Minke whales are not abundant anywhere in the Pacific except in the Bering and Chukchi seas and in the Gulf of Alaska. A Hawaii stock is not recognized (Carretta et al., 2002); there is an Alaska stock that is considered migratory and a "resident" CA/OR/WA stock that establishes home ranges (Dorsey et al., 1990). The IWC identifies three Pacific stocks – one in Sea of Japan/East China Sea, one in remainder of western Pacific west of 180°, and one east of 180°. The modeled stock estimate is the IWC stock estimate for the western North Pacific stock (Approximate point estimate of 25,000; Approximate 95% confidence limits of 12,800-48,600) (IWC website http://www.iwcoffice.org/Estimate.htm accessed 15 June 2003). This is conservative because it is significantly higher than the limited data available on the CA/OR/WA stock. Barlow (2003) acoustically identified the "boing" as minke whales, suggesting that they are more common than previously thought. No density or abundance estimates were provided from the visual data, but are forthcoming from the acoustic data.

Sperm whale: Density estimate is from Mobley's surveys (Mobley et al., 2000; Carretta et al., 2002); stock estimate is from eastern temperate Pacific combined visual and passive acoustic survey (39,200 (CV=0.60)) (Carretta et al., 2002). This conservatively samples diving animals, and resulted in a larger abundance estimate than from visual surveys alone (34, 781 animals from Ferguson and Barlow, 2003)). These data are comparable to that observed by Barlow (2003) in a larger region around Hawaii.

Kogia: Mobley et al. (1999) saw 2 pods for a total of 5 individuals during his 1993-1998 survey efforts. No density or abundance estimates were derived. Hawaiian stocks of pygmy and dwarf sperm whales are recognized (Carretta et al., 2002). Ferguson and Barlow (2003) derived an abundance estimate of 166,553 and density estimate of 0.0017/km^2 for this latitude in the eastern North Pacific.

Cuvier's beaked whale: The best data available on density and abundance estimates are from the eastern tropical Pacific (ETP) at the same latitude: 0.0054 animals/km^2 and 90,725 animals (Ferguson and Barlow, 2003).

Blainville's beaked whale: The best data available on density (0.0013 animals/km^2) and abundance estimates are from the eastern Pacific (Ferguson and Barlow, 2003). The *Mesoplodon densirostris* estimate added to one-fifth of the *Mesoplodon* spp. abundance estimate is 8,032.

Spinner dolphin: The best data available on density (0.0100 animals/km^2) and abundance estimate for whitebelly spinner (1,015,059) from the eastern tropical Pacific (Ferguson and Barlow, 2003) were used**.**

Spotted dolphin: The best data available on density (0.1047 animals/km^2) and abundance estimate for offshore spotted dolphin in the eastern North Pacific (2,195,353) (Ferguson and Barlow, 2003) were used.

Striped dolphin: The best data available on density (0.0602 animals/km^2) and abundance estimate in the eastern North Pacific (1,820,958) (Ferguson and Barlow, 2003) were used.

Bottlenose dolphin: The best data available on density (0.0025 animals/km^2) and abundance estimate in the eastern North Pacific (299,434) (Ferguson and Barlow, 2003) were used.

Rough-toothed dolphin: The best data available on density (0.0058 animals/km^2) and abundance estimate in the eastern North Pacific (145,729) (Ferguson and Barlow, 2003) were used.

Risso's dolphin: Mobley et al. (2000) did not have enough sightings to derive density or abundance estimates. A Hawaiian stock is recognized, though they appear to be rare in the area (Carretta et al., 2002)**. "**Based on the locations of interactions with the Hawaiian longline fishery, it is likely that Risso's dolphins primarily occur in pelagic waters tens to hundreds of miles from the main Hawaiian Islands and are only occasionally found nearshore" (Carretta et al., 2002)**.** Leatherwood and Reeves (1983) state that there is a sighting hiatus at about 20° N along the western coast of the U.S. where Risso's have been intensely studied. This sighting hiatus may extend out to the main Hawaiian Islands, which are centered at about 20° N, and attribute to the rarity of their sightings. Density estimate (0.0007/km^2) and abundance estimate (258,084) are from surveys in the eastern North Pacific (Ferguson and Barlow, 2003).

False killer whale: The best data available on density (0.0021 animals/km^2) and abundance estimate in the eastern North Pacific (35,132) (Ferguson and Barlow, 2003) were used.

Melon-headed whale: The best data available on density (0.0093 animals/km^2) and abundance estimate in the eastern North Pacific (36,770) (Ferguson and Barlow, 2003) were used.

Short-finned pilot whale: The best data available on density (0.0020 animals/km^2) and abundance estimate in the eastern North Pacific (89,334) (Ferguson and Barlow, 2003) were used.

Sea of Japan/Fall

General Area Information:

Harbor porpoise are found in northern Sea of Japan, particularly near Hokkaido and northern Honshu. The most seasonal movements seem to be inshore-offshore rather than north-south. In general, they are a coastal species, limited to cold temperate and subarctic waters of northern hemisphere (Leatherwood and Reeves, 1983). Because of their coastal nature, they were not modeled.

Specific Species Information:

fin whale: Fin whales migrate south in the winter to about 10°N, and are found in the summer from a line near Japan north to the Chukchi Sea and Aleutian Islands (Evans, 1987). Fin whales are known to winter in the Sea of Japan, and are probably found there throughout the year. Since fin whales migrate south from offshore waters of the northwest Pacific, density and stock estimates were derived from encounter rates of Japanese scouting boats in the northwest Pacific (Masaki, 1977; Ohsumi, 1977; Tillman, 1977).

Bryde's whale: Omura (1977) refers to four major whaling grounds on the coast of Japan: waters off Bonin Islands, Sanriku, Wakayama (Taiji), and West Kyushu. None of these are in the Sea of Japan. References to abundance or density estimates for Bryde's whales in Sea of Japan could not be found, though Evans (1987) says that Bryde's whales are found from northern Japan to the equator in the western North Pacific. Therefore, one-half of minke density in the area and the IWC stock estimate for the western North Pacific were used.

minke whale: The west coast of Honshu was seldom used for whaling, but the west side of Hokkaido had established whaling grounds (Ohsumi, 1978). As such, there is limited data on density and stock estimates in the southern portion of the Sea of Japan. However, based on the data available for the northern portion of the Sea of Japan, minke whales are relatively common in these waters. Therefore, estimate encounter rate similar to the favored whaling grounds of the western North Pacific, and IWC stock estimate were used.

gray whale: Western gray whales are genetically distinct from eastern gray whales (LeDuc et al., 2002). Present day range appears to be from summering grounds in west central Okhotsk Sea off the northeast coast of Sakhalin Island, and to wintering grounds in the South China Sea (Weller et al., 2002). They migrate through the Sea of Japan in November through December. The exact migration route is not known, and Omura (1988) indicates that animals were caught along the Chinese and North Korea Sea of Japan coasts. Presumably they maintained a shallow water/nearshore affinity throughout the southern portion of their range.

North Pacific right whale: The western North Pacific right whale population is considered distinct from the eastern population, arbitrarily separated by the 180° line of longitude (Best et al. 2001). The Okhotsk Sea, Kuril Islands, and eastern Kamchatka coast represent major feeding grounds for the western population (Brownell et al. 2001) where animals are typically found May through September (Clapham et al. 2004). Various areas have been proposed for breeding and calving grounds, including the Ryukyu Islands, Yellow Sea, Sea of Japan, offshore waters far from land, and the Bonin Islands, but a lack of winter sightings (Dec-Feb) makes a definitive assessment impossible (Brownell et al. 2001). Clapham et al. (2004) note the extensive offshore component to the right whale's distribution in the 19th century data. Movement north in spring (peak months of Feb-Apr) and south in fall (peak months Sep-Dec) suggest the possibility of two putative sub-populations in the western population that are kept apart by the Japanese islands, though this seems unlikely (Brownell et al. 2001, Clapham et al. 2004). Data from Japanese sighting cruises in the Okhotsk Sea provide an abundance estimate of 922 animals (CV=0.433, 95% CI=404-2,108) (Best et al. 2001) for the western North Pacific population. The western population may be impacted by proposed LFA operations in the spring, fall and winter in the Sea of Japan.

sperm whale: Kasuya and Miyashita (1988) did not report any Japanese whaling stations that processed sperm whales in the Sea of Japan; however, that may be a function of the fact that sperm whales are rarely found in waters of less than 200 m (Leatherwood and Reeves, 1983). Gregr and Trites (2001) reviewed sperm whale catch data off the coast of British Columbia to determine habitat preferences, and it is possible that the Sea of Japan provides adequate conditions for sperm whales. Therefore, density and stock estimates derived from western North Pacific data. Density estimate is one-half of offshore concentrations (Kasuya and Miyashita, 1988), and abundance estimate is one-half of North Pacific stock (Angliss and Lodge, 2002).

Cuvier's beaked whale: No density or stock estimate data are available for this region, Leatherwood and Reeves (1983) state that Cuvier's are relatively common in the Sea of Japan. Considering habitat preferences (e.g., water temperature, bathymetry) it was determined that best data available are Mobley's density estimate (0.0012/km^2) and an abundance estimate of one-half the ETP abundance estimate (Wade and Gerrodette, 1993)**.** The ETP abundance estimate is 20,000 (CV=0.265).

Baird's beaked whale: Kasuya (1986) reported catches of Baird's beaked whales in the Sea of Japan around approximately 37°N (Toyama Bay) and off southern Hokkaido (41-42°N). He states that animals are only found in water depths of 1000-3000 m. Leatherwood and Reeves (1983) refer to a sizeable fishery in Japan where catches of several hundred per year were made in the 1950s. Kasuya (1986) did not report density or stock estimates for the Sea of Japan; therefore, based on his encounter rate and effective search width off the Pacific coast of Japan, derived summer density estimate of 0.0029/km^2. Kasuya's (1986) abundance estimate of 4220 (CV=0.295) covered the region from about 32-40°N and seaward of the Pacific Japanese coast out to about 150°E. Since his surveys did not include habitat further north, the stock estimate is increased to 8,000 to account for unsurveyed areas.

Stejneger's beaked whale: Leatherwood and Reeves (1983) stated that Stejneger's beaked whales are an inhabitant of the cold temperate to subarctic North Pacific, and are found in the northern Sea of Japan. Miyazaki et al. (1987) reported 4 Stejneger's beaked whales that stranded in the Sea of Japan at about 37°N/135°E. Density or stock estimate data are not available for this region. Considering habitat preferences (e.g., water temperature, bathymetry) estimated that Stejneger's density estimate is approximately that of Cuvier's beaked whales and about 1/3 of Baird's beaked whales (modeled 0.0010/km^2) and that they have an abundance estimate of approximately one-half that of Cuvier's beaked whales.

ginkgo-toothed beaked whale: Miyazaki et al. (1987) reported one stranding of *M. ginkgodens* from the southern Sea of Japan. This is probably a separate population from that of the offshore western North Pacific, but data are available. Since there is no data on density or stock estimates are available for this species, roughly estimate that the density estimate for Blainville's beaked whale off Hawaii (Mobley et al., 2000) is approximate to gingko-toothed

beaked whales in this area, and gingko-toothed beaked whale abundance estimate is one-half that of Cuvier's beaked whales in this area (they are a more tropical species).

short-finned pilot whale: Kishiro and Kasuya (1993) reported that short-finned pilot whales are uncommon in the Sea of Japan, and that insufficient information exists from which to determine whether the southern or northern form occurs in the region. Because of limited data specific to this region, data from the Pacific coast of Japan and Taiwan was used. Miyashita (1993) estimated abundance of short-finned pilot whales from 34 sighting cruises associated with the Japanese drive fishery (53,608 (CV=0.224)). He also derived density estimates in 1° latitude by 1° longitude boxes. Since pilot whales are considered uncommon in the area, a density estimate was derived as ¼ the density estimate of the area south of Japan. Kasuya et al. (1988) suggested that there might be more than one stock of short-finned pilot whales off the Pacific coast of Japan and Taiwan, since there is a southern form found south of the Kuroshio Current front (south of 35°N) and a northern form found between the Kuroshio Current front and the Oyashio Current front (from approximately 35-43°N). However, the northern form has not been harvested by Japanese drive fisheries (Kishiro and Kasuya, 1993), and it therefore was not included in the above analyses (Miyashita, 1993).

melon-headed whale: Leatherwood and Reeves (1983) state that melon-headed whales are rare except in the Philippine Sea. Distributed in tropical and subtropical waters, preferring equatorial water masses, they are probably uncommon in the colder waters of the Sea of Japan. With this limited data, density estimate for low-level species ($0.0002/km^2$), approximately 1/10 of Mobley et al. (2000) density estimate for Hawaii waters; and abundance estimate of 15,000 (approximately 1/3 of the ETP abundance estimate (45400 (CV=0.467)) (Wade and Gerrodette, 1993).

false killer whale: Kishiro and Kasuya (1993) reviewed the history of Japanese coastal whaling, reporting that false killer whales were caught on the Noto coast of Japan in the Sea of Japan**.** Miyashita (1993) suggests that animals summering in the Sea of Japan are probably from a different stock, by analogy from Pacific white-sided dolphins. Kishiro and Kasuya (1993) cited Miyashita (1986) as estimating the population wintering in Iki Island waters (in the Korea Strait) and part of the East China Sea at 3,259. Since these data represent only about 1/3 of the habitat of false killer whales in the East China Sea, the population estimate is multiplied by 3 for the stock estimate (9777). Since there are no data available on stock estimates for the Sea of Japan, this value was used for the Sea of Japan population. This is smaller than the estimated abundance of false killer whales off the Pacific coast of Japan (16,668 (CV=0.263)) (Miyashita, 1993), and is therefore conservative. Miyashita (1993) also derived density estimates in 1° latitude by 1° longitude boxes from 34 sighting cruises associated with the Japanese drive fishery from which an average was derived for the Pacific coast of Japan. Since no sightings of false killer whales were made during the survey effort in the Sea of Japan and East China Sea (Miyashita, 1993), the western North Pacific density estimate is halved for the Sea of Japan.

spinner dolphin: Gilpatrick et al. (1987) reported a high density of sightings in the Korea Strait and adjacent waters to the north. Not mentioned in historical Japanese whaling records (Kishiro and Kasuya, 1993);. There are no data on density or stock estimates (Miyashita, 1993). Because frequently associated with spotted dolphins in the ETP (Leatherwood and Reeves, 1983), data on spotted dolphins for density and stock estimates was used.

pantropical spotted dolphin: Miyashita (1993) summarized data from 34 sighting cruises conducted as part of the Japanese drive fishery. There have been no discontinuity in sightings to suggest different stocks, though based on data from the ETP, but it is possible that multiple populations exist in the western North Pacific (Miyashita, 1993). The total population size was 438,064 (CV=0,174); density estimate for western North Pacific was 0.0137/km2. The Sea of Japan animals are estimated to be one-half of the western North Pacific stock (219,032) and density estimates (0.0068/km2).

bottlenose dolphin: Kishiro and Kasuya (1993) reported that bottlenose dolphins were caught at Ohmishima in Yamaguchi Prefecture in the Sea of Japan. Miyashita (1993) reports that reproductive differences suggest that animals from the Pacific and East China Sea are different stocks. Kishiro and Kasuya (1993) cite Miyashita (1986) as estimating the abundance of the stock in the East China Sea as 35,046. Since these data represent only about 1/3 of the habitat of bottlenose dolphins in the East China Sea, the population estimate is multiplied by 3 for the stock estimate (105,138). It is assumed that animals found in the Sea of Japan and South China Sea are of the same stock. No density estimates available for this stock; therefore, density estimate derived for Pacific coast of Japan

(Miyashita, 1993) was used. This is appropriate since bottlenose dolphins were sighted in the Sea of Japan survey effort (Miyashita, 1993).

Risso's dolphin: Kishiro and Kasuya (1993) reported that Risso's dolphin caught on islands in Korea Strait. Miyashita (1993) reports sightings in the Sea of Japan during June surveys (no effort during other months). Suggest by analogy to bottlenose dolphins and Pacific white-sided dolphins that animals summering in Sea of Japan are separate stock from western North Pacific. No separate data reported for the Sea of Japan or East China Sea, though. Therefore, data from the western North Pacific for stock estimate (83,289 (CV=0.179)) and density estimate derived for Pacific coast of Japan (Miyashita, 1993) were used.

common dolphin: Common dolphin have been caught on the Tsushima Islands in the Korea Strait (Kishiro and Kasuya, 1993). There are no data on density or stock estimates (Miyashita, 1993). They are a gregarious species and it is not unusual to find associated with Pacific white-sided dolphins in eastern North Pacific feeding grounds. They are pelagic, offshore creatures encountered along or seaward of the 183-m (100-fm) contour. They are found in waters of temp 10-28°C, and are very widely distributed, occurring in all oceans to the limits of tropical and warm temperate waters (Leatherwood and Reeves, 1983). Because of similar habitat/prey preferences, data on Risso's dolphins for density and stock estimates was used.

Pacific white-sided dolphin: There are no data on density or stock estimates (Miyashita, 1993). They are a gregarious species, pelagic and offshore. They are encountered along or seaward of the 183-m (100-fm) contour. They feed at night on deep-scattering layer. They have a primarily temperate distribution, found north of tropical waters and south of arctic waters (Leatherwood and Reeves, 1983). Because of similar habitat/prey preferences, data on Risso's dolphins for density and stock estimates was used.

Dall's porpoise: They are found only in the North Pacific, primarily north of 36°N in western North Pacific. They are frequently found associated with Pacific white-sided dolphins from 50°N south, and pilot whales from 40°N south. Morphologic differences have been noted between animals from the Pacific coast of Japan (the truei-type), the Sea of Japan and Sea of Okhotsk (the dalli-type), and the offshore northwestern Pacific and western Bering Sea (the dalli-type). They are present in oceanic waters to at least 100 km from shore and are abundant throughout their range (Leatherwood and Reeves, 1983). Hayano et al. (2003) conducted genetic studies on the three populations, and found a low but there is a significant difference between the Sea of Japan-Okhotsk population and the other two populations. The Sea of Japan population is known to migrate into the Pacific Ocean via the Tsugaru Strait, and into the Sea of Okhotsk through the Soya Strait in the summer (Amano and Kuramochi, 1992). Miyashita and Kasuya (1988) estimated a minimum estimate of dalli-type individuals wintering in the Sea of Japan at about 46,000. No density estimates were available for the area; based on encounter rate and effective search widths off the western U.S. (Barlow, 1997), a rough density estimate of 0.0157/km^2 was derived.

East China Sea/Winter

Specific Species Information:

fin whale: Fin whales winter in the East China Sea and Yellow Sea. The East China Sea population is thought to be resident and may represent a distinct population (Evans, 1987). There is limited data on distribution and abundance, however. Therefore, density estimate for low-level species and estimated stock of around 500 individuals were used.

Bryde's whale: Yoshida and Kato (1999) identified 3 stocks of Bryde's whales in the western North Pacific: Solomon Islands/Southeast Asia stock (mainly Philippine wates and the Gulf of Thailand), East China Sea, and offshore western North Pacific. Ohsumi (1977) density estimate. The IWC website is the source of stock estimate for western North Pacific stock (22,000).

minke whale: Minke whales are reported from the East China Sea and the Yellow Sea, and, as a cosmopolitan species, they are expected to be present. However, there is limited data on density and stock estimates. Therefore, estimate encounter rate similar to the favored whaling grounds of the western North Pacific and IWC stock estimate were used.

gray whale: Exact location of winter breeding grounds are not known, though it is hypothesized that they winter in the East and South China seas, in the vicinity of Korea and China (Evans, 1987; Omura, 1988). The exact migration route is not known, but they are believed to migrate directly across the East China Sea, one of the few times that they leave their shallow water, nearshore habitat (Omura, 1988). During this time, they may be found up to 400 nm offshore. (Weller, 2002). Weller et al. (1999) conducted photo-id studies in the Sakhalin region to begin to characterize this population. It is believed that the total population size is less than 100 individuals. As such, a density estimate in the area is for a very low-level species.

North Pacific right whale: The western North Pacific right whale population is considered distinct from the eastern population, arbitrarily separated by the 180° line of longitude (Best et al. 2001). The Okhotsk Sea, Kuril Islands, and eastern Kamchatka coast represent major feeding grounds for the western population (Brownell et al. 2001) where animals are typically found May through September (Clapham et al. 2004). Various areas have been proposed for breeding and calving grounds, including the Ryukyu Islands, Yellow Sea, Sea of Japan, offshore waters far from land, and the Bonin Islands, but a lack of winter sightings (Dec-Feb) makes a definitive assessment impossible (Brownell et al. 2001). Clapham et al. (2004) note the extensive offshore component to the right whale's distribution in the 19th century data. Movement north in spring (peak months of Feb-Apr) and south in fall (peak months Sep-Dec) suggest the possibility of two putative sub-populations in the western population that are kept apart by the Japanese islands, though this seems unlikely (Brownell et al. 2001, Clapham et al. 2004). Data from Japanese sighting cruises in the Okhotsk Sea provide an abundance estimate of 922 animals (CV=0.433, 95% CI=404-2,108) (Best et al. 2001) for the western North Pacific population. The western population may be impacted by proposed LFA operations in the winter in the East China Sea.

sperm whale: De Boer (2000) sighted sperm whales in the South China Sea, and suggested that animals seen west of the Balabac Strait might be migrating between the South China Sea and the Sulu Sea. With such movement, it is possible that animals might also be found in the East China Sea. Habitat characteristics suggest that conditions are conducive for sperm whales. Because this region is found in the lower latitudes, it is most probable that females and juveniles would be in the area. Therefore, the density estimate is one-half of that for animals found off the Pacific coast of Japan, and the abundance estimate is one-half of the North Pacific stock estimate (Angliss and Lodge, 2002).

Kogia: No density or abundance estimates are available. Wade and Gerrodette (1993) derived an abundance estimate of 11,200 (CV=0.294) *Kogia simus* for the ETP. The best abundance estimate for the CA/OR/WA stock is 4746 (CV=0.67); the minimum abundance estimate is 2837 (Carretta et al., 2002). Therefore, considering this the best data to be used, low-level density estimate (0.0001/km^2) and a stock estimate of 3000 that is less than ETP data is conservative.

Cuvier's beaked whale: No density or stock estimate data are available for this region. Considering habitat preferences (e.g., water temperature, bathymetry), it was determined that Cuvier's is a species with a low-level density estimate (0.0001/km^2) and with an abundance estimate of approximately one-half the ETP abundance estimate (Wade and Gerrodette, 1993)**.** The ETP abundance estimate is 20,000 (CV=0.265).

ginkgo-toothed beaked whale: Miyazaki et al. (1987) reported no strandings of *M. ginkgodens* in the East China Sea. There is probably a separate population from that of the offshore western North Pacific. Density estimates of low-level species (0.0001/km^2) and stock estimates for one-half of Cuvier's were used.

Blainville's beaked whale: Miyazaki et al. (1987) did not report any strandings of *M. densirostris* from the East China Sea. There is probably a separate population from that of the offshore western North Pacific. Density estimates of low-level species (0.0001/km^2) and stock estimates one-half of Cuvier's were used.

false killer whale: Miyashita (1993) suggests that animals summering in the Sea of Japan are probably from a different stock than animals off the western North Pacific, by analogy from Pacific white-sided dolphins. Kishiro and Kasuya (1993) cited Miyashita (1986) as estimating the population wintering in the East China Sea at 3,259. Since these data represent only about 1/3 of the habitat of false killer whales in the East China Sea, the population estimate is multiplied by 3 for the stock estimate (9777). There are no data on density estimates for the East China Sea. Miyashita (1993) derived density estimates in 1° latitude by 1° longitude boxes from 34 sighting cruises associated with the Japanese drive fishery from which an average was derived for the Pacific coast of Japan. Since

no sightings of false killer whales were made during the survey effort in the Sea of Japan and East China Sea (Miyashita, 1993), the western North Pacific density estimate is halved for the East China Sea.

pygmy killer whale: Leatherwood and Reeves (1983) they were no where abundant; widely distributed in tropical waters. Seen relatively frequently in the ETP, especially near Hawaii and off Japan. There was no mention in Japanese whaling records (Kishiro and Kasuya, 1993); no data on density or stock estimates off Japan or Taiwan (Miyashita, 1993). There was no density estimate in Hawaii (Mobley et al., 2000). Population estimate in ETP of 38,900 (Wade and Gerrodette, 1993) and low-level density estimate (0.0001/km^2) and average stock estimate (10,000) were used.

melon-headed whale: Leatherwood and Reeves (1983) stated that melon-headed whales are rare except in the Philippine Sea. Distributed in tropical and subtropical waters, preferring equatorial water masses, they are probably uncommon in the colder waters of the East China Sea. With this limited data, density estimate for low-level species (0.0002/km^2), approximately 1/10 of Mobley et al. (2000) density estimate for Hawaii waters; and abundance estimate of 15,000 (approximately 1/3 of the ETP abundance estimate (45400 (CV=0.467)) (Wade and Gerrodette, 1993) were used.

short-finned pilot whale: Kishiro and Kasuya (1993) reported that short-finned pilot whales are uncommon in the East China Sea, and that insufficient information exists from which to determine whether the southern or northern form occurs in the region. Because of limited data specific to this region, data from the Pacific coast of Japan and Taiwan was used. Miyashita (1993) estimated abundance of short-finned pilot whales from 34 sighting cruises associated with the Japanese drive fishery (53,608 (CV=0.224)). He also derived density estimates in 1° latitude by 1° longitude boxes. Since pilot whales are considered uncommon in this area, a density estimate was derived as ¼ the density estimate of the area south of Japan. Kasuya et al. (1988) suggested that there might be more than one stock of short-finned pilot whales off the Pacific coast of Japan and Taiwan, since there is a southern form found south of the Kuroshio Current front (south of 35°N) and a northern form found between the Kuroshio Current front and the Oyashio Current front (from approximately 35-43°N). However, the northern form has not been harvested by Japanese drive fisheries (Kishiro and Kasuya, 1993), and therefore, it was not included in the above analyses (Miyashita, 1993).

Risso's dolphin: Kishiro and Kasuya (1993) reported that Risso's dolphin inhabit the East China Sea. Miyashita (1993) reported sightings in the East China Sea during June and September surveys (no effort during other months). Suggested by analogy to bottlenose dolphins and Pacific white-sided dolphins, animals summering in Sea of Japan are separate stock from western North Pacific. No separate data reported for the Sea of Japan or East China Sea exist. Therefore, data from the western North Pacific for stock estimate (83,289 (CV=0.179)) and density estimate derived for southeast Pacific coast of Japan/east of Taiwan (Miyashita, 1993) were used.

Fraser's dolphin: Fraser's dolphins are highly gregarious. Groups of a hundred to a thousand have been observed; and are occasionally found mixed in herds of spotted dolphins, and observed in company of false killer whales, sperm whales, striped dolphins, and spinner dolphins. Their diet consists of squid, crustaceans, and deep-sea fish. They are a tropical, pelagic species (Leatherwood and Reeves, 1983). Kishiro and Kasuya (1993) reported catches off the Pacific coast of Japan in drive fisheries. Dolar et al. (2003) reported Fraser's and spinners found together in the eastern Sulu Sea, Philippines. Their feeding ecology is compared to that of spinner and Fraser's dolphins. Spinner dolphins feed primarily in upper 200 m, but maybe as deep as 400 m whereas Fraser's are more diverse, feeding from the surface to as deep as 600 m. Without any data on stock or density estimates, spotted dolphin density and stock estimates were used.

rough-toothed dolphin: Their distribution is primarily pelagic, in tropical to warm temperate waters. They are seen from time to time with bottlenose dolphins and short-finned pilot whales. They are reportedly rare off Japan and in the heavily studied eastern tropical Pacific. There are no data on stock or density estimates for the western North Pacific; therefore, Mobley et al. (2000) density estimate from Hawaii waters (0.0017/km^2) and Wade and Gerrodette (1993) stock estimate from ETP (145,900 (CV=0.320)) were used.

common dolphin: Common dolphin have been caught on Goto Island in the East China Sea (Kishiro and Kasuya, 1993). There are no data on density or stock estimates (Miyashita, 1993). They are a gregarious species and it is not unusual to find associated with Pacific white-sided dolphins in eastern North Pacific feeding grounds. They are

pelagic, offshore creatures encountered along or seaward of the 183-m (100-fm) contour. They can be found in waters of temperature 10-28°C and are very widely distributed, occurring in all oceans to the limits of tropical and warm temperate waters (Leatherwood and Reeves, 1983). Because of similar habitat/prey preferences, data on Risso's dolphins for density and stock estimates were used.

bottlenose dolphin: Kishiro and Kasuya (1993) reported that bottlenose dolphins were caught in the Korea Strait and on Goto Island in the East China Sea. Miyashita (1993) reports that reproductive differences suggest that the animals from the Pacific and East China Sea are different stocks. Kishiro and Kasuya (1993) cited Miyashita (1986) as estimating the abundance of the stock in the East China Sea as 35,046. Since these data represent only about 1/3 of the habitat of bottlenose dolphins in the East China Sea, the population estimate is multiplied by 3 for the stock estimate (105,138). No density estimates were available for this stock; therefore, density estimate derived for southeast Pacific coast of Japan/east of Taiwan (Miyashita, 1993) was used. This is appropriate since bottlenose dolphins were sighted in the East China Sea survey effort (Miyashita, 1993).

Pacific white-sided dolphin: There are no data on density or stock estimates (Miyashita, 1993). They are a gregarious species and are pelagic, offshore creatures encountered along or seaward of the 100-fm contour. They feed at night on deep-scattering layer;. They primarily have a temperate distribution, found north of tropical waters and south of arctic waters (Leatherwood and Reeves, 1983). Because of similar habitat/prey preferences, data on Risso's dolphins for density and stock estimates were used.

spinner dolphin: Gilpatrick et al. (1987) reported a high density of sightings in the Korea Strait and adjacent waters to the north. None reported from the East China Sea. They are not mentioned in historical Japanese whaling records (Kishiro and Kasuya, 1993) and there is no data on density or stock estimates (Miyashita, 1993). Because they are frequently associated with spotted dolphins in the ETP (Leatherwood and Reeves, 1983), data on spotted dolphins for density and stock estimates were used.

pantropical spotted dolphin: Gilpatrick et al. (1987) reported some animals from along the chain of the Ryukyu Islands. Miyashita (1993) summarized data from 34 sighting cruises conducted as part of the Japanese drive fishery. There is no discontinuity in sightings, which suggests different stocks, though based on data from the ETP, but it is possible that multiple populations exist in the western North Pacific (Miyashita, 1993). Total population size was 438,064 (CV=0.174); density estimate for western North Pacific was 0.0137/km^2. Sea of Japan animals were estimated at one-half western North Pacific stock (219,032) and density estimates (0.0068/km^2).

South China Sea/Spring

Specific Species Information:

fin whale: De Boer (2000) conducted a research cruise in the Indian Ocean Sanctuary and the South China Sea from 29 March to 17 April, 1999. Fin whales and a sperm whale were sighted west of the Balabac Strait, suggesting a possible migration route of these species between the South China Sea and the Sulu Sea. De Boer's cruise is the first record of fin whales in the South China Sea. As such, there are no data on density or stock estimates. Density estimates of low-level species were used which estimated the stock to be around 500 animals.

Bryde's whale: Animals found in this area are considered part of the Southeast Asia stock of Bryde's whales, which includes waters of the Philippine Sea and Gulf of Thailand (Yoshida and Kato, 1999). These animals are the offshore form of *Balaenoptera edeni*. De Boer (2000) sighted Bryde's whales during his cruise. There are no data specific to this stock. Ohsumi (1977) density estimate. The IWC website is source of stock estimate for western North Pacific stock (22,000).

minke whale: As a cosmopolitan species, minke whales are expected to be present in the South China Sea, though De Boer (2000) did not observe them during his recent cruise through the area. Because of the limited data on density and stock estimates, the density estimated is one-half of that derived from encounter rate data in the western North Pacific, and IWC stock estimate was used.

gray whale: Gray whales are not expected in the area during spring and, therefore, were not modeled**.** The exact wintering grounds are not known, though, they are believed to winter in the South China Sea in the vicinity of Korea and China (Evans, 1987; Omura, 1988). Presumably, they maintained a shallow water/nearshore affinity throughout the southern portion of their range.

sperm whale: De Boer (2000) sighted sperm whales in the South China Sea, and suggested that animals seen west of the Balabac Strait might be migrating between the South China Sea and the Sulu Sea. No data on density estimates or stock estimates were provided. Because this region is found in the lower latitudes, it is most probable that females and juveniles would be in the area. Therefore, the density estimate is one-half of that for animals found off the Pacific coast of Japan, and the abundance estimate is one-half of the North Pacific stock estimate (Angliss and Lodge, 2002).

Kogia: Smith et al. (1997) reported that *Kogia* were found in "whale temples" in nations surrounding the South China Sea. Density or abundance estimates are not available. Wade and Gerrodette (1993) derived an abundance estimate of 11,200 (CV=0.294) *Kogia simus* for the ETP. The best abundance estimate for the CA/OR/WA stock is 4746 (CV=0.67); the minimum abundance estimate is 2837 (Carretta et al., 2002). Therefore, considering this to be the best data, low-level density estimate (0.0001/km^2) and a stock estimate of 3000 that is less than ETP data was modeled and considered to be conservative.

Cuvier's beaked whale: De Boer (1999) sighted Cuvier's beaked whales during his cruise through the South China Sea. Density and stock estimate data are not available for this region. Their abitat preferences (e.g., water temperature, bathymetry) determine that Cuvier's is a species with a low-level density estimate (0.0001/km^2) and with an abundance estimate of approximately one-half the ETP abundance estimate (Wade and Gerrodette, 1993)**.** The ETP abundance estimate is 20,000 (CV=0.265).

ginkgo-toothed beaked whale: Miyazaki et al. (1987) report no strandings of *M. ginkgodens* from the South China Sea, and De Boer (1999) did not observe *M. ginkgodens* during his research cruise. This is probably a separate population from that of the offshore western North Pacific. Density estimates of low-level species (0.0001/km^2) and stock estimates one-half of Cuvier's were used.

Blainville's beaked whale: Miyazaki et al. (1987) did not report any strandings of *M. densirostris* from the South China Sea. De Boer (1999) did not observe any *M. densirostris* during his research cruise. This is probably a separate population from that of the offshore western North Pacific. Density estimate of low-level species (0.0001/km^2) and stock estimate one-half of Cuvier's were used.

false killer whale: Miyashita (1993) suggests that animals summering in the Sea of Japan are probably from a different stock, by analogy from Pacific white-sided dolphins. Animals in the East and South China seas are probably part of this stock. Kishiro and Kasuya (1993) cited Miyashita (1986) as estimating the population wintering in the East China Sea at 3,259. Since these data represent only about 1/3 of the habitat of false killer whales in the East China Sea, the population estimate is multiplied by 3 for the stock estimate (9777). False killer whales are sighted infrequently in the South China Sea (De Boer, 1999; Smith et al., 1997). There are no data on density estimates for the South China Sea. Miyashita (1993) derived density estimates in 1° by 1° boxes from 34 sighting cruises associated with the Japanese drive fishery from which a weighted-average was derived for the Pacific coast of Japan. Since false killer whales are sighted infrequently in the South China Sea, the western North Pacific density estimate is halved for South China Sea.

pygmy killer whale: Leatherwood and Reeves (1983) report that pygmy killer whales were not abundant in any single area and that they are widely distributed in tropical waters. They are seen relatively frequently in the ETP, especially near Hawaii and off Japan. Seen by De Boer (1999) during his research cruise through the South China Sea, They are known for historical "whale temples" (Smith et al., 1997). There is no mention of them in Japanese whaling records (Kishiro and Kasuya, 1993) and there are no data on density or stock estimates off Japan or Taiwan (Miyashita, 1993). There are no density estimates in Hawaii (Mobley et al., 2000). The population estimate in ETP is 38,900 (Wade and Gerrodette, 1993). Low-level density estimates (0.0001/km^2) and average stock estimates (10,000) were used.

melon-headed whale: Leatherwood and Reeves (1983) stated that melon-headed whales are rare except in the Philippine Sea. Distributed in tropical and subtropical waters, they prefer equatorial water masses and have been observed in the South China Sea (De Boer, 1999) and in "whale temples" on islands surrounding the South China Sea (Smith et al., 1997). However, with limited data on density and stock estimates, density estimate for low-level species (0.0002/km^2), approximately 1/10 of Mobley et al. (2000) density estimate for Hawaii waters; and abundance estimate of 15,000 (approximately 1/3 of the ETP abundance estimate (45400 (CV=0.467)) (Wade and Gerrodette, 1993).

short-finned pilot whale: Smith et al. (1997) reported that short-finned pilot whales are found in "whale temples" on islands surrounding the South China Sea. De Boer (1999) did not observe pilot whales during his research cruise. With limited data for this particular region, data from the Pacific coast of Japan were used. Miyashita (1993) estimated abundance of short-finned pilot whales from 34 sighting cruises associated with the Japanese drive fishery (53,608 (CV=0.224)). He also derived density estimates in 1° latitude by 1° longitude boxes. Kishiro and Kasuya (1993) reported a southern limit to the short-finned pilot whale range of approximately 20°N. Therefore, a density estimate was derived as one-half the density estimate of the area south of Japan. Kasuya et al. (1988) suggested that there might be more than one stock of short-finned pilot whales off the Pacific coast of Japan and Taiwan, since there is a southern form found south of the Kuroshio Current front (south of 35°N) and a northern form found between the Kuroshio Current front and the Oyashio Current front (from approximately 35-43°N). However, the northern form has not been harvested by Japanese drive fisheries (Kishiro and Kasuya, 1993), and therefore, it was not included in the above analyses (Miyashita, 1993).

Risso's dolphin: Smith et al. (1997) reported that Risso's dolphins are commonly found in "whale temples" in nations on the South China Sea. They were not seen by De Boer (1999) during his research cruise. Miyashita (1993) suggests by analogy to bottlenose dolphins and Pacific white-sided dolphins that animals summering in Sea of Japan are separate stock from western North Pacific. There are no separate data reported for the Sea of Japan, East China Sea, or South China Sea, though. Therefore, the western North Pacific stock estimate (83,289 (CV=0.179)) and the density estimate derived for southeast Pacific coast of Japan/east of Taiwan (Miyashita, 1993) were used.

Fraser's dolphin: Highly gregarious, groups of a hundred to a thousand Fraser's dolphins have been observed. They are occasionally found mixed in herds of spotted dolphins and observed in company of false killer whales, sperm whales, striped dolphins, and spinner dolphins. Their diet consists of squid, crustaceans, and deep-sea fish. They are a tropical, pelagic species (Leatherwood and Reeves, 1983). Kishiro and Kasuya (1993) report catches off the Pacific coast of Japan in drive fisheries. Dolar et al. (2003) report Fraser's and spinners found together in the eastern Sulu Sea, Philippines. Their feeding ecology is compared to that of spinner dolphins, spinners feed primarily in upper 200 m, but maybe as deep as 400 m whereas Fraser's are more diverse, feeding from the surface to as deep as 600 m. Without any data on stock or density estimates, spotted dolphin density and stock estimates were used.

rough-toothed dolphin: Their distribution primarily is pelagic, in tropical to warm temperate waters. They are seen from time to time with bottlenose dolphins and short-finned pilot whales. They are reportedly rare off Japan and in the heavily studied eastern tropical Pacific. They can be found in "whale temples" in South China Sea nations (Smith et al., 1997). There are no data on stock or density estimates for the western North Pacific; therefore, Mobley et al. (2000) density estimate from Hawaii waters (0.0017/km^2) and Wade and Gerrodette (1993) stock estimate from ETP (145,900 (CV=0.320)) were used**.**

common dolphin: Common dolphins are found in "whale temples" in nations along the South China Sea (Smith et al., 1997). There are no data on density or stock estimates (Miyashita, 1993). A gregarious species, it is not unusual to find associated them with Pacific white-sided dolphins in eastern North Pacific feeding grounds. They are pelagic, offshore creatures encountered along or seaward of the 183-m (100-fm) contour. They are found in waters of temperature 10-28°C, are very widely distributed, and occur in all oceans to the limits of tropical and warm temperate waters (Leatherwood and Reeves, 1983). Because of similar habitat/prey preferences, data on Risso's dolphins for density and stock estimates were used.

bottlenose dolphin: Smith et al. (1997) reported that bottlenose dolphins are found in "whale temples" in South China Sea nations. Miyashita (1993) reports that reproductive differences suggest that animals from the Pacific and East China Sea are different stocks. Kishiro and Kasuya (1993) cite Miyashita (1986) as estimating the abundance of

the stock in the East China Sea as 35,046. Since these data represent only about 1/3 of the habitat of bottlenose dolphins in the East China Sea, the population estimate is multiplied by 3 for the stock estimate (105,138). It is assumed that animals found in the Sea of Japan and South China Sea are of the same stock. No density estimates are available for this stock; therefore, density estimate derived for southeast Pacific coast of Japan/east of Taiwan (Miyashita, 1993) were used.

Pacific white-sided dolphin: There are no data on density or stock estimates (Miyashita, 1993). Pacific white-sided dolphins are a gregarious species. They are pelagic, offshore animals encountered along or seaward of the 100-fm contour. They feed at night on deep-scattering layer. They have primarily a temperate distribution, found north of tropical waters and south of arctic waters (Leatherwood and Reeves, 1983). Because of similar habitat/prey preferences, data on Risso's dolphins for density and stock estimates were used.

spinner dolphin: Gilpatrick et al. (1987) reported a high density of sightings in the Korea Strait and adjacent waters to the north. No spinner dolphins were reported from the South China Sea. They are also not mentioned in historical Japanese whaling records (Kishiro and Kasuya, 1993); no data on density or stock estimates (Miyashita, 1993). Reported during De Boer (1999) research cruise, and from historical "whale temples" (Smith et al., 1997). Because frequently associated with spotted dolphins in the ETP (Leatherwood and Reeves, 1983), data on spotted dolphins for density and stock estimates were used.

pantropical spotted dolphin: Pantropical spotted dolphins were reported during De Boer (1999) research cruise, and from historical "whale temples" (Smith et al., 1997). Gilpatrick et al. (1987) summarized one report from west of Taiwan in the northern portion of the South China Sea. Miyashita (1993) summarized data from 34 sighting cruises conducted as part of the Japanese drive fishery. There was no discontinuity in sightings to suggest different stocks, though based on data from the ETP, it is possible that multiple populations exist in the western North Pacific (Miyashita, 1993). Total population size was 438,064 (CV=0,174); density estimate for western North Pacific was 0.0137/km^2. Estimate that Sea of Japan animals at one-half western North Pacific stock (219,032) and density estimates (0.0068/km^2).

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Enclosure (4)
Estimates for Potential Effects to Marine Mammal Stocks

Table 4-1. Estimates of Percentage of Marine Mammal Stocks Potentially Affected for Site 1

East of Japan					
Site 1	**Animal**	**# Animals in Area**	**# Animals Stock**	**% Affected (w/mit) 120-180 dB**	**% Affected (w/mit) ≥ 180 dB**
	Blue whale	60	9250	0.25	0.00
	Fin whale	60	9250	0.25	0.00
	Sei whale	180	37000	0.19	0.00
	Bryde's whale	180	22000	0.31	0.00
	Minke whale	1080	25000	1.76	0.00
	N. Pacific right whale	3	922	0.12	0.00
	Sperm whale	300	102112	0.10	0.00
	Kogia	930	166553	0.20	0.00
	Ginkgo-toothed beaked whale	30	22799	0.24	0.00
	Cuvier's beaked whale	324	90725	0.64	0.00
	Baird's beaked whale	174	8000	3.92	0.00
	Hubbs' beaked whale	30	22799	0.24	0.00
	False killer whale	1080	16668	2.95	0.00
	Pygmy killer whale	630	30214	0.95	0.00
	Melon-headed whale	60	15000	0.17	0.00
	Short-finned pilot whale	3840	53608	3.09	0.00
	Spinner dolphin	42	1015059	0.01	0.00
	Fraser's dolphin	1200	220789	0.27	0.00
	Common dolphin	22830	3286163	0.35	0.00
	Bottlenose dolphin	5130	168791	1.60	0.00
	Pantropical spotted dolphin	7770	438064	0.89	0.00
	Rough-toothed dolphin	1770	145729	0.61	0.00
	Striped dolphin	3330	570038	0.29	0.00
	Risso's dolphin	2910	83289	1.84	0.00
	Pacific white-sided dolphin	2460	100757	1.23	0.00

Table 4-2. Estimates of Percentage of Marine Mammal Stocks Potentially Affected for Site 2

North Philippine Sea					
Site 2	**Animal**	**# Animals in Area**	**# Animals Stock**	**% Affected (w/mit) 120-180 dB**	**% Affected (w/mit) ≥ 180 dB**
	Minke whale	1080	25000	1.45	0.00
	Bryde's whale	180	22000	0.27	0.00
	N. Pacific right whale	3	922	0.12	0.00
	Sperm whale	300	102112	0.09	0.00
	Kogia	930	166553	0.17	0.00
	Ginkgo-toothed beaked whale	28	22799	0.22	0.00
	Blainville's beaked whale	28	8032	0.63	0.00
	Cuvier's beaked whale	1620	90725	0.60	0.00
	Killer whale	120	12256	0.35	0.00
	Pygmy killer whale	126	30241	0.75	0.00
	False killer whale	870	16668	1.88	0.00
	Short-finned pilot whale	4590	53608	3.08	0.00
	Bottlenosed dolphin	4380	168791	1.12	0.00
	Risso's dolphin	3180	83289	1.65	0.00
	Pantropical spotted dolphin	4110	438064	0.36	0.00
	Striped dolphin	9870	570038	0.66	0.00

Table 4-3. Estimates of Percentage of Marine Mammal Stocks Potentially Affected for Site 3

West Philippine Sea					
Site 3	**Animal**	**# Animals in Area**	**# Animals Stock**	**% Affected (w/mit) 120-180 dB**	**% Affected (w/mit) ≥ 180 dB**
	Fin whale	60	9250	0.30	0.00
	Bryde's whale	180	22000	0.37	0.00
	Minke whale	540	25000	0.98	0.00
	Humpback whale (winter only)	0	394	0.00	0.00
	Sperm whale	300	102112	0.11	0.00
	Kogia	510	166553	0.11	0.00
	Ginkgo-toothed beaked whale	150	22799	0.25	0.00
	Cuvier's beaked whale	90	90725	0.04	0.00
	Blainville's beaked whale	150	8032	0.72	0.00
	False killer whale	870	16668	2.38	0.00
	Pygmy killer whale	630	30241	0.95	0.00
	Melon-headed whale	4290	36770	5.32	0.00
	Short-finned pilot whale	2280	53608	1.94	0.00
	Spinner dolphin	150	1015059	0.01	0.00
	Fraser's dolphin	1200	220789	0.27	0.00
	Common dolphin	16860	3286163	0.26	0.00
	Bottlenose dolphin	4380	168791	1.37	0.00
	Pantropical spotted dolphin	4110	438064	0.47	0.00
	Rough-toothed dolphin	1770	145729	0.61	0.00
	Striped dolphin	4920	570038	0.44	0.00
	Risso's dolphin	3180	83289	2.02	0.00
	Pacific white-sided dolphin	7350	100757	3.68	0.00

Table 4-4. Estimates of Percentage of Marine Mammal Stocks Potentially Affected for Site 4

Guam					
Site 4	**Animal**	**# Animals in Area**	**# Animals Stock**	**% Affected (w/mit) 120-180 dB**	**% Affetced (w/mit) ≥ 180 dB**
	Blue whale	60	4048	0.85	0.00
	Fin whale	60	1898	1.82	0.00
	Bryde's whale	270	5765	2.92	0.00
	Humpback whale (winter only)	0	4005	0.00	0.00
	Minke whale	60	25000	0.15	0.00
	Sperm whale	300	39200	0.40	0.00
	Cuvier's beaked whale	1620	90725	0.94	0.00
	Blainville's beaked whale	390	8032	2.56	0.00
	Kogia	510	166553	0.16	0.00
	Spinner dolphin	3000	1015059	0.27	0.00
	Pantropical spotted dolphin	31410	2195353	1.30	0.00
	Striped dolphin	18060	1820958	0.90	0.00
	Bottlenose dolphin	750	299434	0.25	0.00
	Rough-toothed dolphin	1740	145729	1.09	0.00
	Risso's dolphin	210	258084	0.08	0.00
	False killer whale	630	35132	1.38	0.00
	Melon-headed whale	2790	36770	5.83	0.00
	Short-finned pilot whale	600	89334	0.52	0.00

Table 4-5. Estimates of Percentage of Marine Mammal Stocks Potentially Affected for Site 5

Sea of Japan					
Site 5	**Animal**	**# Animals in Area**	**# Animals Stock**	**% Affected (w/mit) 120-180 dB**	**% Affected (w/mit) ≥ 180 dB**
	Fin whale	47	9250	0.22	0.00
	Bryde's whale	534	22000	1.05	0.00
	Minke whale	1068	25000	1.85	0.00
	Gray whale	3	100	1.30	0.00
	N. Pacific right whale	3	922	0.12	0.00
	Sperm whale	120	50000	0.09	0.00
	Stejneger's beaked whale	300	5000	2.30	0.00
	Baird's beaked whale	870	8000	4.18	0.00
	Cuvier's beaked whale	360	10000	1.38	0.00
	Ginkgo-toothed beaked whale	240	5000	1.84	0.00
	False killer whale	960	53608	0.90	0.00
	Short-finned pilot whale	541	9777	2.79	0.00
	Melon-headed whale	60	15000	0.20	0.00
	Spinner dolphin	2040	219032	0.49	0.00
	Bottlenose dolphin	2040	219032	0.49	0.00
	Risso's dolphin	5124	105138	2.81	0.00
	Common dolphin	2903	83289	2.01	0.00
	Pacific white-sided dolphin	2903	83289	1.84	0.00
	Pantropical spotted dolphin	2910	83289	1.84	0.00
	Dall's porpoise	4707	46000	5.40	0.00

Table 4-6. Estimates of Percentage of Marine Mammal Stocks Potentially Affected for Site 6

East China Sea					
Site 6	**Animal**	**# Animals in Area**	**# Animals Stock**	**% Affected (w/mit) 120-180 dB**	**% Affected (w/mit) ≥ 180 dB**
	Fin whale	3	500	0.00	0.00
	Bryde's whale	180	10000	0.91	0.00
	Minke whale	1080	25000	2.18	0.00
	Gray whale (winter only)	3	100	1.51	0.00
	N. Pacific right whale	3	922	0.12	0.00
	Sperm whale	113	50000	0.08	0.00
	Kogia	30	3000	0.36	0.00
	Ginkgo-toothed beaked whale	30	5000	0.23	0.00
	Cuvier's beaked whale	30	10000	0.12	0.00
	Blainville's beaked whale	30	5000	0.23	0.00
	False killer whale	540	9777	2.52	0.00
	Pygmy killer whale	30	10000	0.14	0.00
	Melon-headed whale	60	15000	0.18	0.00
	Short-finned pilot whale	960	53608	0.82	0.00
	Spinner dolphin	4122	219032	1.04	0.00
	Fraser's dolphin	4122	219032	1.04	0.00
	Common dolphin	3180	83289	2.11	0.00
	Bottlenose dolphin	4380	105138	2.60	0.00
	Rough-toothed dolphin	510	145900	0.19	0.00
	Pantropical spotted dolphin	4122	219032	1.04	0.00
	Risso's dolphin	3180	83289	2.38	0.00
	Pacific white-sided dolphin	3180	83289	2.11	0.00

Table 4-7. Estimates of Percentage of Marine Mammal Stocks Potentially Affected for Site 7

South China Sea					
Site 7	**Animal**	**# Animals in Area**	**# Animals Stock**	**% Affected (w/mit) 120-180 dB**	**% Affected (w/mit) ≥ 180 dB**
	Fin whale	3	500	0.00	0.00
	Bryde's whale	180	10000	0.65	0.00
	Minke whale	540	25000	0.78	0.00
	Gray whale (winter only)	0	100	0.00	0.00
	Sperm whale	113	50000	0.06	0.00
	Kogia	30	3000	0.26	0.00
	Ginkgo-toothed beaked whale	30	5000	0.17	0.00
	Cuvier's beaked whale	30	10000	0.09	0.00
	Blainville's beaked whale	30	5000	0.17	0.00
	False killer whale	540	9777	2.12	0.00
	Pygmy killer whale	30	10000	0.12	0.00
	Melon-headed whale	60	15000	0.15	0.00
	Short-finned pilot whale	2289	53608	1.64	0.00
	Spinner dolphin	4122	219032	0.86	0.00
	Fraser's dolphin	4122	219032	0.86	0.00
	Common dolphin	3180	83289	1.74	0.00
	Bottlenose dolphin	4380	105138	2.10	0.00
	Pantropical spotted dolphin	4122	219032	0.86	0.00
	Rough-toothed dolphin	510	145900	0.16	0.00
	Risso's dolphin	3180	83289	1.92	0.00
	Pacific white-sided dolphin	3180	83289	1.74	0.00